

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
27 May 2004 (27.05.2004)

PCT

(10) International Publication Number  
**WO 2004/043456 A1**

(51) International Patent Classification<sup>7</sup>: **A61K 31/397**,  
A61P 25/00

SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(21) International Application Number:  
PCT/US2003/035027

**Declarations under Rule 4.17:**

(22) International Filing Date:  
3 November 2003 (03.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/424,165 6 November 2002 (06.11.2002) US  
60/493,318 7 August 2003 (07.08.2003) US

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, HR, HU, ID, IL, IN, IS, JP, KG, KR, KZ, LC, LK, LR, LT, LU, LV, MA, MD, MG, MK, MN, MX, MZ, NI, NO, NZ, PG, PH, PL, PT, RO, RU, SC, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UZ, VC, VN, YU, ZA, ZM, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

(71) Applicant: **SCHERING CORPORATION** [US/US];  
2000 Galloping Hill Road, Kenilworth, NJ 07033-0530  
(US).

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, HR, HU, ID, IL, IN, IS, JP, KG, KR, KZ, LC, LK, LR, LT, LU, LV, MA, MD, MG, MK, MN, MX, MZ, NI, NO, NZ, PG, PH, PL, PT, RO, RU, SC, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UZ, VC, VN, YU, ZA, ZM, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

(72) Inventors: **FINE, Jay, S.**; 11 Aldon Terrace, Bloomfield,  
NJ 07003 (US). **PARKER, Eric, McFee**; 50 Rambling  
Drive, Scotch Plains, NJ 07076 (US).

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations  
— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

(74) Agent: **CANNONI, Ann, Marie**; Schering-Plough Corporation, Patent Department-K-6-1 1990, 2000 Galloping Hill Road, Kenilworth, NJ 07033-0530 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, HR, HU, ID, IL, IN, IS, JP, KG, KR, KZ, LC, LK, LR, LT, LU, LV, MA, MD, MG, MK, MN, MX, MZ, NI, NO, NZ, PG, PH, PL, PT, RO, RU, SC, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UZ, VC, VN, YU, ZA, ZM.

**Published:**

— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **CHOLESTEROL ABSORPTION INHIBITORS FOR THE TREATMENT OF DEMYELINATION**

(57) Abstract: The present invention provides methods for treating demyelination and associated conditions by administering at least one sterol absorption inhibitor and compositions, therapeutic combinations and methods including : (a) at least one sterol absorption inhibitor; and (b) at least one demyelination treatment which can be useful for preventing or treating demyelination and associated conditions, such as multiple sclerosis.

WO 2004/043456 A1

## CHOLESTEROL ABSORPTION INHIBITORS FOR THE TREATMENT OF DEMYELINATION

5

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority from U.S. Provisional Patent Application Serial No. 60/493,318, filed August 7, 2003 and U.S. Provisional Patent Application Serial No. 60/424,165, filed November 6, 2002.

10

BACKGROUND OF THE INVENTIONField of the Invention

The present invention relates to methods and therapeutic combinations for treating and preventing demyelination in a subject comprising the administration of sterol absorption inhibitor(s).

Description

Nerve fibers are wrapped with many layers of insulation known as the myelin sheath. Like insulation around an electrical wire, the myelin sheath permits electrical impulses to be conducted along the nerve fiber with speed and accuracy. When normal development of the myelin is impaired (for example in subjects having Tay-Sachs disease, Niemann-Pick disease, Gaucher's disease and Hurler's syndrome), permanent, extensive neurological defects can result. Also, the myelin sheath can be damaged by stroke, inflammation, immune diseases, metabolic disorders, poison or drugs. If the sheath is able to regenerate itself, normal nerve function can be partially or fully restored. If demyelination is extensive, the underlying nerve can die and cause irreversible damage. Demyelination in the central nervous system (brain and spinal cord) occurs in several primary demyelinating diseases, such as multiple sclerosis, acute disseminated encephalomyelitis, adrenoleukodystrophy, adrenomyeloneuropathy, Leber's hereditary optic atrophy and HTLV-associated myelopathy.

Multiple sclerosis ("MS") is characterized by the loss of patches of myelin in the nerves of the eye, brain and/or spinal cord. It is believed that the body produces antibodies against its own myelin that provoke inflammation and damage the myelin

- 2 -

sheath. Heredity and environment appear to play some role in the disease, although it is believed that a virus or unknown antigen somehow triggers the autoimmune process. Symptoms depend upon the area affected. Demyelination in nerve pathways that bring signals to muscles can produce problems with movement (motor symptoms), such as weakness, clumsiness, difficulty in walking or maintaining balance, tremor, double vision, problems with bladder or bowel control, stiffness, unsteadiness or unusual tiredness. Demyelination in nerve pathways that bring signals to the brain can cause sensory symptoms, such as numbness, tingling, dysesthesias, visual disturbances, sexual dysfunction, dizziness or vertigo. Magnetic resonance imaging (MRI) can reveal areas of the brain that have lost myelin, and may even distinguish areas of recent demyelination from areas that occurred some time ago.

Treatments for multiple sclerosis include injection with beta-interferon, which can decrease the frequency and occurrence of flare-ups and slow the progression to disability; injection with glatiramer acetate, which can reduce the frequency of relapses; or administration of corticosteroids, such as prednisone, to relieve acute symptoms. Recently, statins such as simvastatin and atorvastatin (HMG CoA reductase inhibitors) have been studied for their immunomodulatory effects in treating MS. C. Pelfrey, "ACTRIMS – ECTRIMS 2002 (Part II)", *IDDB Meeting Report*, September 18-21, 2002 Baltimore, Maryland, USA, (October 3, 2002).

There is a need in the art for improved compositions and treatments for demyelination and associated diseases such as multiple sclerosis.

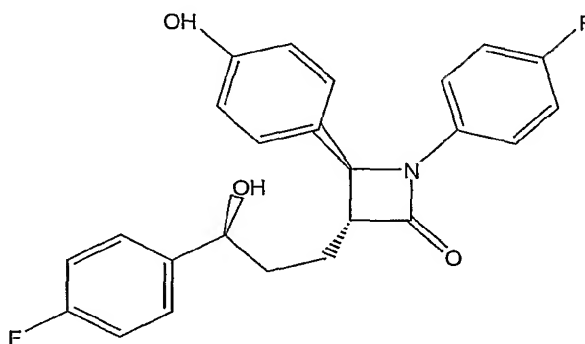
#### SUMMARY OF THE INVENTION

In one embodiment, there is provided a method of treating or preventing demyelination in a subject, comprising the step of administering to a subject in need of such treatment an effective amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof.

In another embodiment, there is provided a method of treating or preventing multiple sclerosis in a subject, comprising the step of administering to a subject in need of such treatment an effective amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof.

- 3 -

A method of treating or preventing demyelination in a subject is provided, comprising the step of administering to a subject in need of such treatment an effective amount of at least one sterol absorption inhibitor represented by Formula (II) below:



(II)

or a pharmaceutically acceptable salt or solvate thereof.

In another embodiment, the present invention provides a composition comprising: (a) at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof and (b) at least one antidemyelination agent.

Therapeutic combinations also are provided comprising: (a) a first amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof; and (b) a second amount of at least one antidemyelination agent, wherein the first amount and the second amount together comprise a therapeutically effective amount for the treatment or prevention of demyelination in a subject.

Pharmaceutical compositions for the treatment or prevention of demyelination in a subject, comprising a therapeutically effective amount of the above compounds, compositions or therapeutic combinations and a pharmaceutically acceptable carrier also are provided.

Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients, reaction conditions, and so forth used in the specification and claims are to be understood as being modified in all instances by the term "about."

- 4 -

DETAILED DESCRIPTION

According to F. Giubilei et al., "Blood Cholesterol and MRI Activity in First Clinical Episode Suggestive of Multiple Sclerosis", Acta Neurol Scand 2002: 106: 109-112, 111, a significant correlation was found between MS disease activity and both total and LDL (low density lipoprotein) cholesterol levels. Lesions formed by demyelination are characterized by the presence of foamy macrophages containing cholesterol esters. J. Newcombe et al., "Low Density Lipoprotein Uptake by Macrophages in Multiple Sclerosis Plaques: Implication for Pathogenesis", Neuropathol. Appl. Neurobiol. 1994: 20:152-62, 152. There is evidence of early involvement of LDL in the development of MS lesions. F. Giubilei at 111. A large proportion of the plasma LDL enters the parenchyma of MS plaques as a result of blood-brain barrier damage and is oxidatively modified in the lesion. Id. Lipid peroxidation and oxidized LDL uptake by infiltrating macrophages or microglial cells in early stages of MS plaque development may play an important role in demyelination. Id.

U.S. Patents Nos. 5,767,115, 5,624,920, 5,668,990, 5,656,624 and 5,688,787, respectively, disclose hydroxy-substituted azetidinone compounds and substituted  $\beta$ -lactam compounds useful for inhibiting the absorption of cholesterol, thereby lowering cholesterol levels and/or inhibiting the formation of cholesterol-containing lesions in mammalian arterial walls. U.S. Patents Nos. 5,846,966 and 5,661,145, respectively, disclose hydroxy-substituted azetidinone compounds or substituted  $\beta$ -lactam compounds in combination with HMG CoA reductase inhibitors for preventing or treating atherosclerosis and reducing plasma cholesterol levels. Such compounds can also be useful in lowering C-reactive protein levels in subjects.

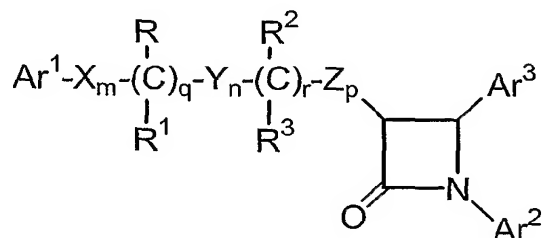
According to the present invention, these and other sterol absorption inhibitors discussed in detail below can be useful in preventing or treating demyelination and its associated conditions, such as primary demyelinating diseases including but not limited to multiple sclerosis, acute disseminated encephalomyelitis, adrenoleukodystrophy, adrenomyeloneuropathy, Leber's hereditary optic atrophy and HTLV-associated myelopathy, and other conditions characterized by demyelination such as Tay-Sachs disease, Niemann-Pick disease, Gaucher's disease and Hurler's syndrome; or stroke, inflammation, immune diseases, metabolic disorders, poison or

- 5 -

drugs.

In one embodiment, the present invention is directed to compositions, pharmaceutical compositions, therapeutic combinations, kits and methods of treatment using the same comprising at least one (one or more) sterol absorption inhibitor(s). Suitable sterol absorption inhibitors include substituted azetidinone sterol absorption inhibitors, substituted  $\beta$ -lactam sterol absorption inhibitors or combinations thereof as discussed in detail below. As used herein, "sterol absorption inhibitor" means a compound capable of inhibiting the absorption of one or more sterols, including but not limited to cholesterol, phytosterols (such as sitosterol, campesterol, stigmasterol and avenosterol), when administered in a therapeutically effective (sterol absorption inhibiting) amount to a subject, such as a mammal or human. Other useful compositions, pharmaceutical compositions, therapeutic combinations, kits and methods of treatment using the same comprise at least one (one or more)  $5\alpha$ -stanol absorption inhibitor(s). As used herein, " $5\alpha$ -stanol absorption inhibitor" means a compound capable of inhibiting the absorption of one or more  $5\alpha$ -stanols (such as cholestanol,  $5\alpha$ -campestanol,  $5\alpha$ -sitostanol), when administered in a therapeutically effective ( $5\alpha$ -stanol absorption inhibiting) amount to a subject, such as a mammal or human.

In a preferred embodiment, sterol or  $5\alpha$ -stanol absorption inhibitors useful in the compositions, therapeutic combinations and methods of the present invention are represented by Formula (I) below:



(I)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (I) above:

$\text{Ar}^1$  and  $\text{Ar}^2$  are independently selected from the group consisting of aryl and  $\text{R}^4$ -substituted aryl;

$\text{Ar}^3$  is aryl or  $\text{R}^5$ -substituted aryl;

- 6 -

X, Y and Z are independently selected from the group consisting of -CH<sub>2</sub>-, -CH(lower alkyl)- and -C(dilower alkyl)-;

R and R<sup>2</sup> are independently selected from the group consisting of -OR<sup>6</sup>, -O(CO)R<sup>6</sup>, -O(CO)OR<sup>9</sup> and -O(CO)NR<sup>6</sup>R<sup>7</sup>;

5 R<sup>1</sup> and R<sup>3</sup> are independently selected from the group consisting of hydrogen, lower alkyl and aryl;

q is 0 or 1; r is 0 or 1; m, n and p are independently selected from 0, 1, 2, 3 or 4; provided that at least one of q and r is 1, and the sum of m, n, p, q and r is 1, 2, 3, 4, 5 or 6; and provided that when p is 0 and r is 1, the sum of m, q and n is 1, 2, 3, 4 or 5;

10 R<sup>4</sup> is 1-5 substituents independently selected from the group consisting of lower alkyl, -OR<sup>6</sup>, -O(CO)R<sup>6</sup>, -O(CO)OR<sup>9</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>6</sup>, -O(CO)NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>(CO)R<sup>7</sup>, -NR<sup>6</sup>(CO)OR<sup>9</sup>, -NR<sup>6</sup>(CO)NR<sup>7</sup>R<sup>8</sup>, -NR<sup>6</sup>SO<sub>2</sub>R<sup>9</sup>, -COOR<sup>6</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -COR<sup>6</sup>, -SO<sub>2</sub>NR<sup>6</sup>R<sup>7</sup>, S(O)<sub>0-2</sub>R<sup>9</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>6</sup>,  
15 -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>6</sup>R<sup>7</sup>, -(lower alkylene)COOR<sup>6</sup>, -CH=CH-COOR<sup>6</sup>, -CF<sub>3</sub>, -CN, -NO<sub>2</sub> and halogen;

R<sup>5</sup> is 1-5 substituents independently selected from the group consisting of -OR<sup>6</sup>, -O(CO)R<sup>6</sup>, -O(CO)OR<sup>9</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>6</sup>, -O(CO)NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>(CO)R<sup>7</sup>, -NR<sup>6</sup>(CO)OR<sup>9</sup>, -NR<sup>6</sup>(CO)NR<sup>7</sup>R<sup>8</sup>, -NR<sup>6</sup>SO<sub>2</sub>R<sup>9</sup>, -COOR<sup>6</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -COR<sup>6</sup>, -  
20 SO<sub>2</sub>NR<sup>6</sup>R<sup>7</sup>, S(O)<sub>0-2</sub>R<sup>9</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>6</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>6</sup>R<sup>7</sup>, -(lower alkylene)COOR<sup>6</sup> and -CH=CH-COOR<sup>6</sup>;

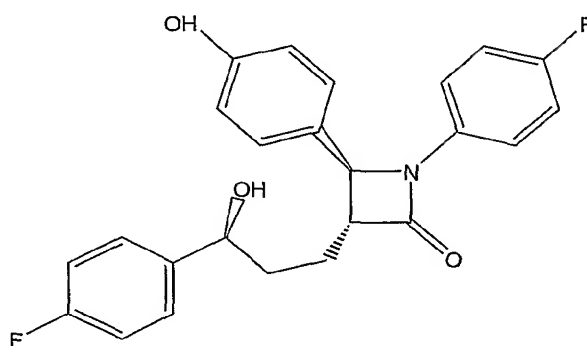
R<sup>6</sup>, R<sup>7</sup> and R<sup>8</sup> are independently selected from the group consisting of hydrogen, lower alkyl, aryl and aryl-substituted lower alkyl; and

25 R<sup>9</sup> is lower alkyl, aryl or aryl-substituted lower alkyl.

Preferably, R<sup>4</sup> is 1-3 independently selected substituents, and R<sup>5</sup> is preferably 1-3 independently selected substituents.

- 7 -

In a preferred embodiment, a sterol or  $5\alpha$ -stanol absorption inhibitor of Formula (I) useful in the compositions, therapeutic combinations and methods of the present invention is represented by Formula (II) (ezetimibe) below:



(II)

or a pharmaceutically acceptable salt or solvate thereof. The compound of Formula (II) can be in anhydrous or hydrated form.

As used herein, the term "alkyl" or "lower alkyl" means straight or branched alkyl chains having from 1 to 6 carbon atoms and "alkoxy" means alkoxy groups having 1 to 6 carbon atoms. Non-limiting examples of lower alkyl groups include, for example methyl, ethyl, propyl, and butyl groups. Where an alkyl chain joins two other variables and is therefore bivalent, the term alkylene is used.

"Aryl" means an aromatic monocyclic or multicyclic ring system comprising about 6 to about 14 carbon atoms, preferably about 6 to about 10 carbon atoms, such as phenyl, naphthyl, indenyl, tetrahydronaphthyl or indanyl.

The statements wherein, for example,  $R$ ,  $R^1$ ,  $R^2$  and  $R^3$  are said to be independently selected from a group of substituents mean that  $R$ ,  $R^1$ ,  $R^2$  and  $R^3$  are each independently selected, but also that where an  $R$ ,  $R^1$ ,  $R^2$  and  $R^3$  variable occurs more than once in a molecule, each occurrence is independently selected (e.g., if  $R$  is  $-OR^6$ , wherein  $R^6$  is hydrogen,  $R^2$  can be  $-OR^6$  wherein  $R^6$  is lower alkyl). Those skilled in the art will recognize that the size and nature of the substituent(s) will affect the number of substituents that can be present.

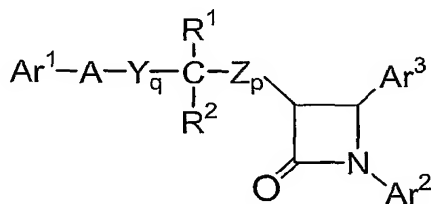
Compounds of Formula I can be prepared by a variety of methods well known to those skilled in the art, for example such as are disclosed in U.S. Patents Nos. 5,631,365, 5,767,115, 5,846,966, 6,207,822, PCT Patent Application No. 02/079174



- 8 -

and PCT Patent Application WO 93/02048, each of which is incorporated herein by reference, and in the Example below.

Alternative sterol absorption inhibitors useful in the compositions, therapeutic combinations and methods of the present invention are represented by Formula (III) below:



(III)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (III) above:

Ar<sup>1</sup> is R<sup>3</sup>-substituted aryl;

Ar<sup>2</sup> is R<sup>4</sup>-substituted aryl;

Ar<sup>3</sup> is R<sup>5</sup>-substituted aryl;

Y and Z are independently selected from the group consisting of -CH<sub>2</sub>-, -CH(lower alkyl)- and -C(dilower alkyl)-;

A is selected from -O-, -S-, -S(O)- or -S(O)<sub>2</sub>-;

R<sup>1</sup> is selected from the group consisting of -OR<sup>6</sup>, -O(CO)R<sup>6</sup>, -O(CO)OR<sup>9</sup> and -O(CO)NR<sup>6</sup>R<sup>7</sup>; R<sup>2</sup> is selected from the group consisting of hydrogen, lower alkyl and aryl; or R<sup>1</sup> and R<sup>2</sup> together are =O;

q is 1, 2 or 3;

p is 0, 1, 2, 3 or 4;

R<sup>5</sup> is 1-3 substituents independently selected from the group consisting of -OR<sup>6</sup>, -O(CO)R<sup>6</sup>, -O(CO)OR<sup>9</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>9</sup>, -O(CO)NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>(CO)R<sup>7</sup>, -NR<sup>6</sup>(CO)OR<sup>9</sup>, -NR<sup>6</sup>(CO)NR<sup>7</sup>R<sup>8</sup>, -NR<sup>6</sup>SO<sub>2</sub>-lower alkyl, -NR<sup>6</sup>SO<sub>2</sub>-aryl, -CONR<sup>6</sup>R<sup>7</sup>, -COR<sup>6</sup>, -SO<sub>2</sub>NR<sup>6</sup>R<sup>7</sup>, S(O)<sub>0-2</sub>-alkyl, S(O)<sub>0-2</sub>-aryl, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>6</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>6</sup>R<sup>7</sup>, o-halogeno, m-halogeno, o-lower alkyl, m-lower alkyl, -(lower alkylene)-COOR<sup>6</sup>, and -CH=CH-COOR<sup>6</sup>;

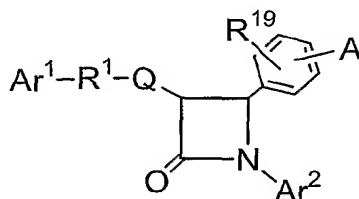
- 9 -

$R^3$  and  $R^4$  are independently 1-3 substituents independently selected from the group consisting of  $R^5$ , hydrogen, p-lower alkyl, aryl,  $-\text{NO}_2$ ,  $-\text{CF}_3$  and p-halogeno;

$R^6$ ,  $R^7$  and  $R^8$  are independently selected from the group consisting of hydrogen, lower alkyl, aryl and aryl-substituted lower alkyl; and  $R^9$  is lower alkyl, aryl or aryl-substituted lower alkyl.

Methods for making compounds of Formula III are well known to those skilled in the art. Non-limiting examples of suitable methods are disclosed in U.S. Patent No. 5,688,990, which is incorporated herein by reference.

In another embodiment, sterol absorption inhibitors useful in the compositions, therapeutic combinations and methods of the present invention are represented by Formula (IV):



(IV)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (IV) above:

A is selected from the group consisting of  $R^2$ -substituted heterocycloalkyl,  $R^2$ -substituted heteroaryl,  $R^2$ -substituted benzofused heterocycloalkyl, and  $R^2$ -substituted benzofused heteroaryl;

$\text{Ar}^1$  is aryl or  $R^3$ -substituted aryl;

$\text{Ar}^2$  is aryl or  $R^4$ -substituted aryl;

Q is a bond or, with the 3-position ring carbon of the azetidinone, forms the

spiro group ; and

$R^1$  is selected from the group consisting of:

$-(\text{CH}_2)_q-$ , wherein q is 2-6, provided that when Q forms a spiro ring, q can also be zero or 1;

- 10 -

$-(CH_2)_e-G-(CH_2)_r-$ , wherein G is  $-O-$ ,  $-C(O)-$ , phenylene,  $-NR^8-$  or  $-S(O)_{0-2}-$ , e is 0-5 and r is 0-5, provided that the sum of e and r is 1-6;

$-(C_2-C_6 \text{ alkenylene})-$ ; and

$-(CH_2)_f-V-(CH_2)_g-$ , wherein V is  $C_3-C_6$  cycloalkylene, f is 1-5 and g is 0-5, provided that the sum of f and g is 1-6;

$R^5$  is selected from:

$-CH-$ ,  $-C(C_1-C_6 \text{ alkyl})-$ ,  $-CF-$ ,  $-C(OH)-$ ,  $-C(C_6H_4-R^9)-$ ,  $-N-$ , or  $-^+NO^-$ ;

$R^6$  and  $R^7$  are independently selected from the group consisting of  $-CH_2-$ ,  $-CH(C_1-C_6 \text{ alkyl})-$ ,  $-C(\text{di-}(C_1-C_6 \text{ alkyl}))-$ ,  $-CH=CH-$  and

$-C(C_1-C_6 \text{ alkyl})=CH-$ ; or  $R^5$  together with an adjacent  $R^6$ , or  $R^5$  together with an adjacent  $R^7$ , form a  $-CH=CH-$  or a  $-CH=C(C_1-C_6 \text{ alkyl})-$  group;

a and b are independently 0, 1, 2 or 3, provided both are not zero; provided that when  $R^6$  is  $-CH=CH-$  or  $-C(C_1-C_6 \text{ alkyl})=CH-$ , a is 1; provided that when  $R^7$  is  $-CH=CH-$  or  $-C(C_1-C_6 \text{ alkyl})=CH-$ , b is 1; provided that when a is 2 or 3, the  $R^6$ 's can be the same or different; and provided that when b is 2 or 3, the  $R^7$ 's can be the same or different;

and when Q is a bond,  $R^1$  also can be selected from:

$-M-Y_d-\overset{\overset{R^{10}}{|}}{\underset{\underset{R^{11}}{|}}{C}}-Z_h-$ ,  $-X_m-\overset{\overset{R^{12}}{|}}{\underset{\underset{R^{13}}{|}}{(C)_s}}-Y_n-\overset{\overset{R^{10}}{|}}{\underset{\underset{R^{11}}{|}}{(C)_t}}-Z_p-$  or  $-X_j-\overset{\overset{R^{10}}{|}}{\underset{\underset{R^{11}}{|}}{(C)_v}}-Y_k-S(O)_{0-2}-$ ;

where M is  $-O-$ ,  $-S-$ ,  $-S(O)-$  or  $-S(O)_2-$ ;

X, Y and Z are independently selected from the group consisting of  $-CH_2-$ ,  $-CH(C_1-C_6 \text{ alkyl})-$  and  $-C(\text{di-}(C_1-C_6 \text{ alkyl}))-$ ;

$R^{10}$  and  $R^{12}$  are independently selected from the group consisting of  $-OR^{14}$ ,  $-O(CO)R^{14}$ ,  $-O(CO)OR^{16}$  and  $-O(CO)NR^{14}R^{15}$ ;

$R^{11}$  and  $R^{13}$  are independently selected from the group consisting of hydrogen,  $(C_1-C_6)$ alkyl and aryl; or  $R^{10}$  and  $R^{11}$  together are  $=O$ , or  $R^{12}$  and  $R^{13}$  together are  $=O$ ;

d is 1, 2 or 3;

- 11 -

h is 0, 1, 2, 3 or 4;

s is 0 or 1; t is 0 or 1; m, n and p are independently 0-4; provided that at least one of s and t is 1, and the sum of m, n, p, s and t is 1-6; provided that when p is 0 and t is 1, the sum of m, s and n is 1-5; and provided that when p is 0 and s is 1, the sum of m, t and n is 1-5;

v is 0 or 1;

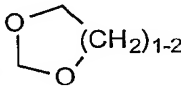
j and k are independently 1-5, provided that the sum of j, k and v is 1-5;

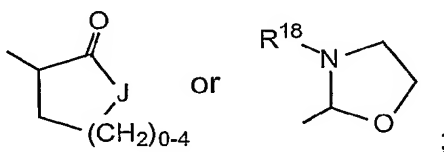
$R^2$  is 1-3 substituents on the ring carbon atoms selected from the group consisting of hydrogen,  $(C_1-C_{10})$ alkyl,  $(C_2-C_{10})$ alkenyl,  $(C_2-C_{10})$ alkynyl,

$(C_3-C_6)$ cycloalkyl,  $(C_3-C_6)$ cycloalkenyl,  $R^{17}$ -substituted aryl,  $R^{17}$ -substituted benzyl,  $R^{17}$ -substituted benzyloxy,  $R^{17}$ -substituted aryloxy, halogeno,  $-NR^{14}R^{15}$ ,  $NR^{14}R^{15}(C_1-C_6 \text{ alkylene})-$ ,  $NR^{14}R^{15}C(O)(C_1-C_6 \text{ alkylene})-$ ,  $-NHC(O)R^{16}$ , OH,  $C_1-C_6$  alkoxy,  $-OC(O)R^{16}$ ,

$-COR^{14}$ , hydroxy $(C_1-C_6)$ alkyl,  $(C_1-C_6)$ alkoxy $(C_1-C_6)$ alkyl,  $NO_2$ ,  $-S(O)_{0-2}R^{16}$ ,  $-$

$SO_2NR^{14}R^{15}$  and  $-(C_1-C_6 \text{ alkylene})COOR^{14}$ ; when  $R^2$  is a substituent on a

heterocycloalkyl ring,  $R^2$  is as defined, or is  $=O$  or ; and, where  $R^2$  is a substituent on a substitutable ring nitrogen, it is hydrogen,  $(C_1-C_6)$ alkyl, aryl,  $(C_1-C_6)$ alkoxy, aryloxy,  $(C_1-C_6)$ alkylcarbonyl, arylcarbonyl, hydroxy,  $-(CH_2)_{1-6}CONR^{18}R^{18}$ ,



wherein J is  $-O-$ ,  $-NH-$ ,  $-NR^{18}-$  or  $-CH_2-$ ;

$R^3$  and  $R^4$  are independently selected from the group consisting of 1-3 substituents independently selected from the group consisting of  $(C_1-C_6)$ alkyl,  $-OR^{14}$ ,  $-O(CO)R^{14}$ ,  $-O(CO)OR^{16}$ ,  $-O(CH_2)_{1-5}OR^{14}$ ,  $-O(CO)NR^{14}R^{15}$ ,  $-NR^{14}R^{15}$ ,  $-NR^{14}(CO)R^{15}$ ,  $-NR^{14}(CO)OR^{16}$ ,  $-NR^{14}(CO)NR^{15}R^{19}$ ,  $-NR^{14}SO_2R^{16}$ ,  $-COOR^{14}$ ,  $-CONR^{14}R^{15}$ ,  $-COR^{14}$ ,  $-SO_2NR^{14}R^{15}$ ,  $S(O)_{0-2}R^{16}$ ,  $-O(CH_2)_{1-10}-COOR^{14}$ ,

- 12 -

$-\text{O}(\text{CH}_2)_{1-10}\text{CONR}^{14}\text{R}^{15}$ ,  $-(\text{C}_1\text{-C}_6 \text{ alkylene})\text{-COOR}^{14}$ ,  $-\text{CH}=\text{CH-COOR}^{14}$ ,  $-\text{CF}_3$ ,  $-\text{CN}$ ,  $-\text{NO}_2$  and halogen;

$\text{R}^8$  is hydrogen,  $(\text{C}_1\text{-C}_6)\text{alkyl}$ , aryl  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ,  $-\text{C}(\text{O})\text{R}^{14}$  or  $-\text{COOR}^{14}$ ;

$\text{R}^9$  and  $\text{R}^{17}$  are independently 1-3 groups independently selected from the group consisting of hydrogen,  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ,  $(\text{C}_1\text{-C}_6)\text{alkoxy}$ ,  $-\text{COOH}$ ,  $\text{NO}_2$ ,  $-\text{NR}^{14}\text{R}^{15}$ ,  $\text{OH}$  and halogeno;

$\text{R}^{14}$  and  $\text{R}^{15}$  are independently selected from the group consisting of hydrogen,  $(\text{C}_1\text{-C}_6)\text{alkyl}$ , aryl and aryl-substituted  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ;

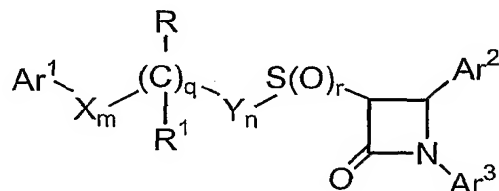
$\text{R}^{16}$  is  $(\text{C}_1\text{-C}_6)\text{alkyl}$ , aryl or  $\text{R}^{17}$ -substituted aryl;

$\text{R}^{18}$  is hydrogen or  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ; and

$\text{R}^{19}$  is hydrogen, hydroxy or  $(\text{C}_1\text{-C}_6)\text{alkoxy}$ .

Methods for making compounds of Formula IV are well known to those skilled in the art. Non-limiting examples of suitable methods are disclosed in U.S. Patent No. 5,656,624, which is incorporated herein by reference.

In another embodiment, sterol absorption inhibitors useful in the compositions, therapeutic combinations and methods of the present invention are represented by Formula (V):



(V)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (V) above:

$\text{Ar}^1$  is aryl,  $\text{R}^{10}$ -substituted aryl or heteroaryl;

$\text{Ar}^2$  is aryl or  $\text{R}^4$ -substituted aryl;

$\text{Ar}^3$  is aryl or  $\text{R}^5$ -substituted aryl;

$\text{X}$  and  $\text{Y}$  are independently selected from the group consisting of  $-\text{CH}_2-$ ,  $-\text{CH}(\text{lower alkyl})-$  and  $-\text{C}(\text{dilower alkyl})-$ ;

- 13 -

R is  $-OR^6$ ,  $-O(CO)R^6$ ,  $-O(CO)OR^9$  or  $-O(CO)NR^6R^7$ ;  $R^1$  is hydrogen, lower alkyl or aryl; or R and  $R^1$  together are  $=O$ ;

q is 0 or 1;

r is 0, 1 or 2;

5 m and n are independently 0, 1, 2, 3, 4 or 5; provided that the sum of m, n and q is 1, 2, 3, 4 or 5;

$R^4$  is 1-5 substituents independently selected from the group consisting of lower alkyl,  $-OR^6$ ,  $-O(CO)R^6$ ,  $-O(CO)OR^9$ ,  $-O(CH_2)_{1-5}OR^6$ ,  $-O(CO)NR^6R^7$ ,  $-NR^6R^7$ ,  $-NR^6(CO)R^7$ ,  $-NR^6(CO)OR^9$ ,  $-NR^6(CO)NR^7R^8$ ,  $-NR^6SO_2R^9$ ,  $-COOR^6$ ,   
10  $-CONR^6R^7$ ,  $-COR^6$ ,  $-SO_2NR^6R^7$ ,  $S(O)_{0-2}R^9$ ,  $-O(CH_2)_{1-10}-COOR^6$ ,  $-O(CH_2)_{1-10}CONR^6R^7$ ,  $-(\text{lower alkylene})COOR^6$  and  $-CH=CH-COOR^6$ ;

$R^5$  is 1-5 substituents independently selected from the group consisting of  $-OR^6$ ,  $-O(CO)R^6$ ,  $-O(CO)OR^9$ ,  $-O(CH_2)_{1-5}OR^6$ ,  $-O(CO)NR^6R^7$ ,  $-NR^6R^7$ ,  $-NR^6(CO)R^7$ ,  $-NR^6(CO)OR^9$ ,  $-NR^6(CO)NR^7R^8$ ,  $-NR^6SO_2R^9$ ,  $-COOR^6$ ,  $-CONR^6R^7$ ,  $-COR^6$ ,   
15  $-SO_2NR^6R^7$ ,  $S(O)_{0-2}R^9$ ,  $-O(CH_2)_{1-10}-COOR^6$ ,  $-O(CH_2)_{1-10}CONR^6R^7$ ,  $-CF_3$ ,  $-CN$ ,  $-NO_2$ , halogen,  $-(\text{lower alkylene})COOR^6$  and  $-CH=CH-COOR^6$ ;

$R^6$ ,  $R^7$  and  $R^8$  are independently selected from the group consisting of hydrogen, lower alkyl, aryl and aryl-substituted lower alkyl;

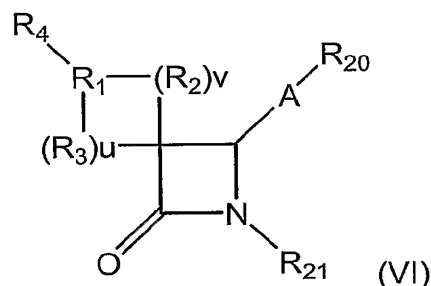
20  $R^9$  is lower alkyl, aryl or aryl-substituted lower alkyl; and

$R^{10}$  is 1-5 substituents independently selected from the group consisting of lower alkyl,  $-OR^6$ ,  $-O(CO)R^6$ ,  $-O(CO)OR^9$ ,  $-O(CH_2)_{1-5}OR^6$ ,  $-O(CO)NR^6R^7$ ,  $-NR^6R^7$ ,  $-NR^6(CO)R^7$ ,  $-NR^6(CO)OR^9$ ,  $-NR^6(CO)NR^7R^8$ ,  $-NR^6SO_2R^9$ ,  $-COOR^6$ ,  $-CONR^6R^7$ ,  $-COR^6$ ,  $-SO_2NR^6R^7$ ,  $-S(O)_{0-2}R^9$ ,  $-O(CH_2)_{1-10}-COOR^6$ ,  $-O(CH_2)_{1-10}CONR^6R^7$ ,   
25  $-CF_3$ ,  $-CN$ ,  $-NO_2$  and halogen.

- 14 -

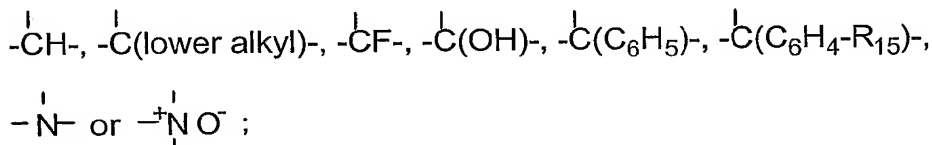
Methods for making compounds of Formula V are well known to those skilled in the art. Non-limiting examples of suitable methods are disclosed in U.S. Patent No. 5,624,920, which is incorporated herein by reference.

In another embodiment, sterol absorption inhibitors useful in the compositions, therapeutic combinations and methods of the present invention are represented by  
 5 Formula (VI):



or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein:

R<sub>1</sub> is



R<sub>2</sub> and R<sub>3</sub> are independently selected from the group consisting of:

-CH<sub>2</sub>-, -CH(lower alkyl)-, -C(di-lower alkyl)-, -CH=CH- and -C(lower alkyl)=CH-; or

R<sub>1</sub> together with an adjacent R<sub>2</sub>, or R<sub>1</sub> together with an adjacent R<sub>3</sub>, form a

15 -CH=CH- or a -CH=C(lower alkyl)- group;

u and v are independently 0, 1, 2 or 3, provided both are not zero; provided that when R<sub>2</sub> is -CH=CH- or -C(lower alkyl)=CH-, v is 1; provided that when R<sub>3</sub> is -CH=CH- or -C(lower alkyl)=CH-, u is 1; provided that when v is 2 or 3, the R<sub>2</sub>'s can be the same or different; and provided that when u is 2 or 3, the R<sub>3</sub>'s can be the same or  
 20 different;

R<sub>4</sub> is selected from B-(CH<sub>2</sub>)<sub>m</sub>C(O)-, wherein m is 0, 1, 2, 3, 4 or 5;

B-(CH<sub>2</sub>)<sub>q</sub>-, wherein q is 0, 1, 2, 3, 4, 5 or 6; B-(CH<sub>2</sub>)<sub>e</sub>-Z-(CH<sub>2</sub>)<sub>r</sub>-, wherein Z is -O-,

-C(O)-, phenylene, -N(R<sub>8</sub>)- or -S(O)<sub>0-2</sub>-, e is 0, 1, 2, 3, 4 or 5 and r is 0, 1, 2, 3, 4 or 5, provided that the sum of e and r is 0, 1, 2, 3, 4, 5 or 6; B-(C<sub>2</sub>-C<sub>6</sub> alkenylene)-; B-(C<sub>4</sub>-

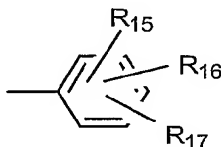
25 C<sub>6</sub> alkadienylene)-; B-(CH<sub>2</sub>)<sub>t</sub>-Z-(C<sub>2</sub>-C<sub>6</sub> alkenylene)-, wherein Z is as defined above,

- 15 -

and wherein t is 0, 1, 2 or 3, provided that the sum of t and the number of carbon atoms in the alkenylene chain is 2, 3, 4, 5 or 6; B-(CH<sub>2</sub>)<sub>f</sub>-V-(CH<sub>2</sub>)<sub>g</sub>-, wherein V is C<sub>3</sub>-C<sub>6</sub> cycloalkylene, f is 1, 2, 3, 4 or 5 and g is 0, 1, 2, 3, 4 or 5, provided that the sum of f and g is 1, 2, 3, 4, 5 or 6; B-(CH<sub>2</sub>)<sub>t</sub>-V-(C<sub>2</sub>-C<sub>6</sub> alkenylene)- or B-(C<sub>2</sub>-C<sub>6</sub> alkenylene)-V-(CH<sub>2</sub>)<sub>t</sub>-, wherein V and t are as defined above, provided that the sum of t and the number of carbon atoms in the alkenylene chain is 2, 3, 4, 5 or 6; B-(CH<sub>2</sub>)<sub>a</sub>-Z-(CH<sub>2</sub>)<sub>b</sub>-V-(CH<sub>2</sub>)<sub>d</sub>-, wherein Z and V are as defined above and a, b and d are independently 0, 1, 2, 3, 4, 5 or 6, provided that the sum of a, b and d is 0, 1, 2, 3, 4, 5 or 6; or T-(CH<sub>2</sub>)<sub>s</sub>-, wherein T is cycloalkyl of 3-6 carbon atoms and s is 0, 1, 2, 3, 4, 5 or 6; or

R<sub>1</sub> and R<sub>4</sub> together form the group  $\text{B}-\text{CH}=\overset{\text{I}}{\text{C}}-$ ;

B is selected from indanyl, indenyl, naphthyl, tetrahydronaphthyl, heteroaryl or W-substituted heteroaryl, wherein heteroaryl is selected from the group consisting of pyrrolyl, pyridinyl, pyrimidinyl, pyrazinyl, triazinyl, imidazolyl, thiazolyl, pyrazolyl, thienyl, oxazolyl and furanyl, and for nitrogen-containing heteroaryls, the N-oxides thereof, or



W is 1 to 3 substituents independently selected from the group consisting of lower alkyl, hydroxy lower alkyl, lower alkoxy, alkoxyalkyl, alkoxyalkoxy, alkoxyalkoxyalkoxy, (lower alkoxyimino)-lower alkyl, lower alkanedioyl, lower alkyl lower alkanedioyl, allyloxy, -CF<sub>3</sub>, -OCF<sub>3</sub>, benzyl, R<sub>7</sub>-benzyl, benzyloxy, R<sub>7</sub>-benzyloxy, phenoxy, R<sub>7</sub>-phenoxy, dioxolanyl, NO<sub>2</sub>, -N(R<sub>8</sub>)(R<sub>9</sub>), N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylene-, N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkyleneoxy-, OH, halogeno, -CN, -N<sub>3</sub>, -NHC(O)OR<sub>10</sub>, -NHC(O)R<sub>10</sub>, R<sub>11</sub>O<sub>2</sub>SNH-, (R<sub>11</sub>O<sub>2</sub>S)<sub>2</sub>N-, -S(O)<sub>2</sub>NH<sub>2</sub>, -S(O)<sub>0-2</sub>R<sub>8</sub>, tert-butyl, dimethyl-silyloxymethyl, -C(O)R<sub>12</sub>, -COOR<sub>19</sub>, -CON(R<sub>8</sub>)(R<sub>9</sub>), -CH=CHC(O)R<sub>12</sub>, -lower alkylene-C(O)R<sub>12</sub>, R<sub>10</sub>C(O)(lower alkyleneoxy)-, N(R<sub>8</sub>)(R<sub>9</sub>)C(O)(lower

alkyleneoxy)- and  $-\text{CH}_2-\text{N} \begin{array}{c} \diagup \quad \diagdown \\ \diagdown \quad \diagup \end{array} \text{R}_{13}$  for substitution on ring carbon atoms,



- 16 -

and the substituents on the substituted heteroaryl ring nitrogen atoms, when present, are selected from the group consisting of lower alkyl, lower alkoxy, -C(O)OR<sub>10</sub>, -C(O)R<sub>10</sub>, OH, N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylene-, N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylenyloxy-, -S(O)<sub>2</sub>NH<sub>2</sub> and 2-(trimethylsilyl)-ethoxymethyl;

5 R<sub>7</sub> is 1-3 groups independently selected from the group consisting of lower alkyl, lower alkoxy, -COOH, NO<sub>2</sub>, -N(R<sub>8</sub>)(R<sub>9</sub>), OH, and halogeno;

R<sub>8</sub> and R<sub>9</sub> are independently selected from H or lower alkyl;

R<sub>10</sub> is selected from lower alkyl, phenyl, R<sub>7</sub>-phenyl, benzyl or R<sub>7</sub>-benzyl;

10 R<sub>11</sub> is selected from OH, lower alkyl, phenyl, benzyl, R<sub>7</sub>-phenyl or R<sub>7</sub>-benzyl;

R<sub>12</sub> is selected from H, OH, alkoxy, phenoxy, benzyloxy,



R<sub>13</sub> is selected from -O-, -CH<sub>2</sub>-, -NH-, -N(lower alkyl)- or -NC(O)R<sub>19</sub>;

15 R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are independently selected from the group consisting of H and the groups defined for W; or R<sub>15</sub> is hydrogen and R<sub>16</sub> and R<sub>17</sub>, together with adjacent carbon atoms to which they are attached, form a dioxolanyl ring;

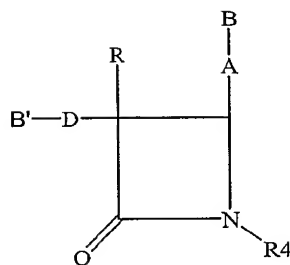
R<sub>19</sub> is H, lower alkyl, phenyl or phenyl lower alkyl; and

20 R<sub>20</sub> and R<sub>21</sub> are independently selected from the group consisting of phenyl, W-substituted phenyl, naphthyl, W-substituted naphthyl, indanyl, indenyl, tetrahydronaphthyl, benzodioxolyl, heteroaryl, W-substituted heteroaryl, benzofused heteroaryl, W-substituted benzofused heteroaryl and cyclopropyl, wherein heteroaryl is as defined above.

25 Methods for making compounds of Formula VI are well known to those skilled in the art. Non-limiting examples of suitable methods are disclosed in U.S. Patent No. 5,698,548, which is incorporated herein by reference.

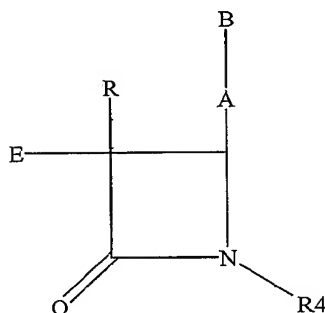
In another embodiment, sterol absorption inhibitors useful in the compositions, therapeutic combinations and methods of the present invention are represented by Formulas (VIIA) and (VIIB):

- 17 -



(VIIA)

and

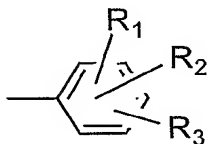


(VIIB)

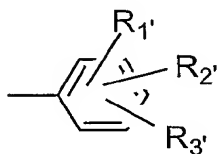
or a pharmaceutically acceptable salt or solvate thereof,  
wherein:

A is  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$  or  $-(\text{CH}_2)_p-$  wherein p is 0, 1 or 2;

B is



B' is



D is  $-(\text{CH}_2)_m\text{C}(\text{O})-$  or  $-(\text{CH}_2)_q-$  wherein m is 1, 2, 3 or 4 and q is 2, 3 or 4;

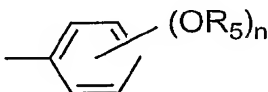
E is  $\text{C}_{10}$  to  $\text{C}_{20}$  alkyl or  $-\text{C}(\text{O})-(\text{C}_9 \text{ to } \text{C}_{19})\text{-alkyl}$ , wherein the alkyl is straight or  
branched, saturated or containing one or more double bonds;

R is hydrogen,  $\text{C}_1\text{-C}_{15}$  alkyl, straight or branched, saturated or containing one  
or more double bonds, or  $\text{B}-(\text{CH}_2)_r-$ , wherein r is 0, 1, 2, or 3;

- 18 -

R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>1'</sub>, R<sub>2'</sub>, and R<sub>3'</sub> are independently selected from the group consisting of hydrogen, lower alkyl, lower alkoxy, carboxy, NO<sub>2</sub>, NH<sub>2</sub>, OH, halogeno, lower alkylamino, dilower alkylamino, -NHC(O)OR<sub>5</sub>, R<sub>6</sub>O<sub>2</sub>SNH- and -S(O)<sub>2</sub>NH<sub>2</sub>;

R<sub>4</sub> is

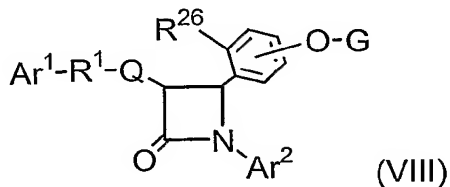


wherein n is 0, 1, 2 or 3;

R<sub>5</sub> is lower alkyl; and

R<sub>6</sub> is OH, lower alkyl, phenyl, benzyl or substituted phenyl wherein the substituents are 1-3 groups independently selected from the group consisting of lower alkyl, lower alkoxy, carboxy, NO<sub>2</sub>, NH<sub>2</sub>, OH, halogeno, lower alkylamino and dilower alkylamino; or a pharmaceutically acceptable salt thereof or a solvate thereof.

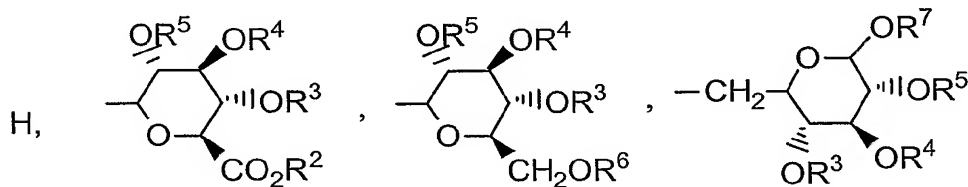
In another embodiment, sterol absorption inhibitors useful in the compositions and methods of the present invention are represented by Formula (VIII):



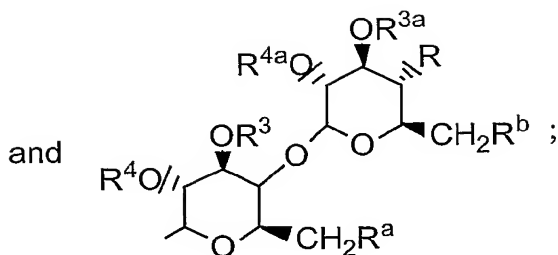
or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (VIII) above,

R<sup>26</sup> is H or OG<sup>1</sup>;

G and G<sup>1</sup> are independently selected from the group consisting of



- 19 -

provided that when R<sup>26</sup> is H or

OH, G is not H;

R, R<sup>a</sup> and R<sup>b</sup> are independently selected from the group consisting of H, -OH, halogeno, -NH<sub>2</sub>, azido, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)-alkoxy or -W-R<sup>30</sup>;

W is independently selected from the group consisting of -NH-C(O)-, -O-C(O)-, -O-C(O)-N(R<sup>31</sup>)-, -NH-C(O)-N(R<sup>31</sup>)- and -O-C(S)-N(R<sup>31</sup>)-;

R<sup>2</sup> and R<sup>6</sup> are independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl and aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>7</sup>, R<sup>3a</sup> and R<sup>4a</sup> are independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)(C<sub>1</sub>-C<sub>6</sub>)alkyl and -C(O)aryl;

R<sup>30</sup> is selected from the group consisting of R<sup>32</sup>-substituted T, R<sup>32</sup>-substituted-T-(C<sub>1</sub>-C<sub>6</sub>)alkyl, R<sup>32</sup>-substituted-(C<sub>2</sub>-C<sub>4</sub>)alkenyl, R<sup>32</sup>-substituted-(C<sub>1</sub>-C<sub>6</sub>)alkyl, R<sup>32</sup>-substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl and R<sup>32</sup>-substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>31</sup> is selected from the group consisting of H and (C<sub>1</sub>-C<sub>4</sub>)alkyl;

T is selected from the group consisting of phenyl, furyl, thienyl, pyrrolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, benzothiazolyl, thiadiazolyl, pyrazolyl, imidazolyl and pyridyl;

R<sup>32</sup> is independently selected from 1-3 substituents independently selected from the group consisting of halogeno, (C<sub>1</sub>-C<sub>4</sub>)alkyl, -OH, phenoxy, -CF<sub>3</sub>, -NO<sub>2</sub>, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, methylenedioxy, oxo, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, -N(CH<sub>3</sub>)<sub>2</sub>, -C(O)-NH(C<sub>1</sub>-C<sub>4</sub>)alkyl, -C(O)-N((C<sub>1</sub>-C<sub>4</sub>)alkyl)<sub>2</sub>, -C(O)-(C<sub>1</sub>-C<sub>4</sub>)alkyl, -C(O)-(C<sub>1</sub>-C<sub>4</sub>)alkoxy and pyrrolidinylcarbonyl; or R<sup>32</sup> is a covalent bond and R<sup>31</sup>, the nitrogen to which it is

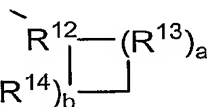
- 20 -

attached and R<sup>32</sup> form a pyrrolidinyl, piperidinyl, N-methyl-piperazinyl, indolinyl or morpholinyl group, or a (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl-substituted pyrrolidinyl, piperidinyl, N-methylpiperazinyl, indolinyl or morpholinyl group;

Ar<sup>1</sup> is aryl or R<sup>10</sup>-substituted aryl;

5 Ar<sup>2</sup> is aryl or R<sup>11</sup>-substituted aryl;

Q is a bond or, with the 3-position ring carbon of the azetidinone,

forms the spiro group ; and

R<sup>1</sup> is selected from the group consisting of

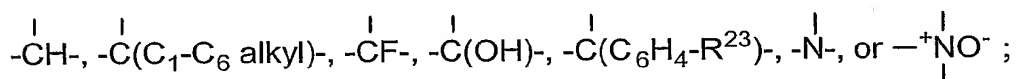
10 -(CH<sub>2</sub>)<sub>q</sub>-, wherein q is 2-6, provided that when Q forms a spiro ring, q can also be zero or 1;

-(CH<sub>2</sub>)<sub>e</sub>-E-(CH<sub>2</sub>)<sub>r</sub>-, wherein E is -O-, -C(O)-, phenylene, -NR<sup>22</sup>- or -S(O)<sub>0-2</sub>-, e is 0-5 and r is 0-5, provided that the sum of e and r is 1-6;

-(C<sub>2</sub>-C<sub>6</sub>)alkenylene-; and

15 -(CH<sub>2</sub>)<sub>f</sub>-V-(CH<sub>2</sub>)<sub>g</sub>-, wherein V is C<sub>3</sub>-C<sub>6</sub> cycloalkylene, f is 1-5 and g is 0-5, provided that the sum of f and g is 1-6;

R<sup>12</sup> is

; -CH-, -C(C<sub>1</sub>-C<sub>6</sub> alkyl)-, -CF-, -C(OH)-, -C(C<sub>6</sub>H<sub>4</sub>-R<sup>23</sup>)-, -N-, or -<sup>+</sup>NO<sup>-</sup>;

R<sup>13</sup> and R<sup>14</sup> are independently selected from the group consisting of

-CH<sub>2</sub>-, -CH(C<sub>1</sub>-C<sub>6</sub> alkyl)-, -C(di-(C<sub>1</sub>-C<sub>6</sub>) alkyl), -CH=CH- and

20 -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-; or R<sup>12</sup> together with an adjacent R<sup>13</sup>, or R<sup>12</sup> together with an adjacent R<sup>14</sup>, form a -CH=CH- or a -CH=C(C<sub>1</sub>-C<sub>6</sub> alkyl)- group;

a and b are independently 0, 1, 2 or 3, provided both are not zero;

provided that when R<sup>13</sup> is -CH=CH- or -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-, a is 1;

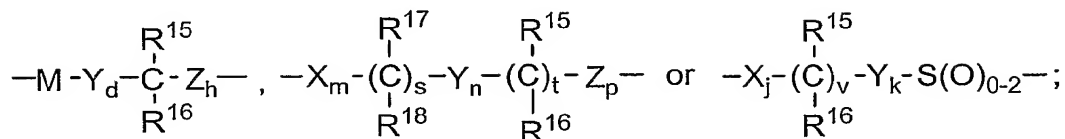
provided that when R<sup>14</sup> is -CH=CH- or -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-, b is 1;

25 provided that when a is 2 or 3, the R<sup>13</sup>'s can be the same or different; and

provided that when b is 2 or 3, the R<sup>14</sup>'s can be the same or different;

- 21 -

and when Q is a bond, R<sup>1</sup> also can be:



M is -O-, -S-, -S(O)- or -S(O)<sub>2</sub>-;

X, Y and Z are independently selected from the group consisting of  
 5 -CH<sub>2</sub>-, -CH(C<sub>1</sub>-C<sub>6</sub>)alkyl- and -C(di-(C<sub>1</sub>-C<sub>6</sub>)alkyl);

R<sup>10</sup> and R<sup>11</sup> are independently selected from the group consisting of  
 1-3 substituents independently selected from the group consisting of  
 (C<sub>1</sub>-C<sub>6</sub>)alkyl, -OR<sup>19</sup>, -O(CO)R<sup>19</sup>, -O(CO)OR<sup>21</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>19</sup>,  
 -O(CO)NR<sup>19</sup>R<sup>20</sup>, -NR<sup>19</sup>R<sup>20</sup>, -NR<sup>19</sup>(CO)R<sup>20</sup>, -NR<sup>19</sup>(CO)OR<sup>21</sup>,  
 10 -NR<sup>19</sup>(CO)NR<sup>20</sup>R<sup>25</sup>, -NR<sup>19</sup>SO<sub>2</sub>R<sup>21</sup>, -COOR<sup>19</sup>, -CONR<sup>19</sup>R<sup>20</sup>, -COR<sup>19</sup>,  
 -SO<sub>2</sub>NR<sup>19</sup>R<sup>20</sup>, S(O)<sub>0-2</sub>R<sup>21</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>19</sup>,  
 -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>19</sup>R<sup>20</sup>, -(C<sub>1</sub>-C<sub>6</sub> alkylene)-COOR<sup>19</sup>, -CH=CH-COOR<sup>19</sup>,  
 -CF<sub>3</sub>, -CN, -NO<sub>2</sub> and halogen;

R<sup>15</sup> and R<sup>17</sup> are independently selected from the group consisting of  
 15 -OR<sup>19</sup>, -O(CO)R<sup>19</sup>, -O(CO)OR<sup>21</sup> and -O(CO)NR<sup>19</sup>R<sup>20</sup>;

R<sup>16</sup> and R<sup>18</sup> are independently selected from the group consisting of H,  
 (C<sub>1</sub>-C<sub>6</sub>)alkyl and aryl; or R<sup>15</sup> and R<sup>16</sup> together are =O, or R<sup>17</sup> and R<sup>18</sup> together are  
 =O;

d is 1, 2 or 3;

h is 0, 1, 2, 3 or 4;

s is 0 or 1; t is 0 or 1; m, n and p are independently 0-4;

provided that at least one of s and t is 1, and the sum of m, n, p, s and t is 1-6;

provided that when p is 0 and t is 1, the sum of m, s and n is 1-5; and provided

that when p is 0 and s is 1, the sum of m, t and n is 1-5;

v is 0 or 1;

j and k are independently 1-5, provided that the sum of j, k and v is 1-5;

- 22 -

and when Q is a bond and  $R^1$  is 
$$-X_j-\overset{\overset{R^{15}}{|}}{\underset{\underset{R^{16}}{|}}{(C)}_v}-Y_k-S(O)_{0-2}-$$
,  $Ar^1$  can also be pyridyl, isoxazolyl, furanyl, pyrrolyl, thienyl, imidazolyl, pyrazolyl, thiazolyl, pyrazinyl, pyrimidinyl or pyridazinyl;

$R^{19}$  and  $R^{20}$  are independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl and aryl-substituted (C<sub>1</sub>-C<sub>6</sub>)alkyl;

$R^{21}$  is (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl or  $R^{24}$ -substituted aryl;

$R^{22}$  is H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl (C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O) $R^{19}$  or -COOR<sup>19</sup>;

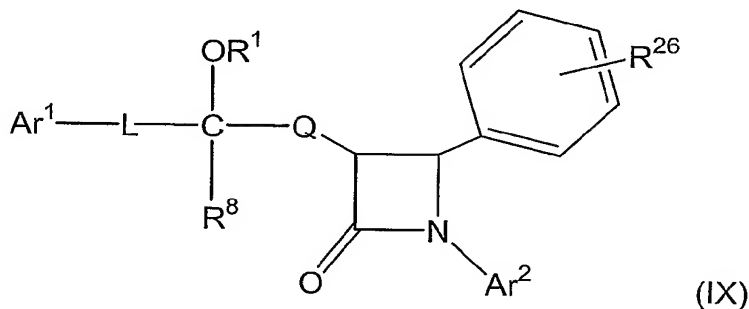
$R^{23}$  and  $R^{24}$  are independently 1-3 groups independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>6</sub>)alkoxy, -COOH, NO<sub>2</sub>,

-NR<sup>19</sup>R<sup>20</sup>, -OH and halogeno; and

$R^{25}$  is H, -OH or (C<sub>1</sub>-C<sub>6</sub>)alkoxy.

Methods for making compounds of Formula VIII are well known to those skilled in the art. Non-limiting examples of suitable methods are disclosed in U.S. Patent No. 5,756,470, which is incorporated herein by reference.

In another embodiment, sterol absorption inhibitors useful in the compositions and methods of the present invention are represented by Formula (IX) below:

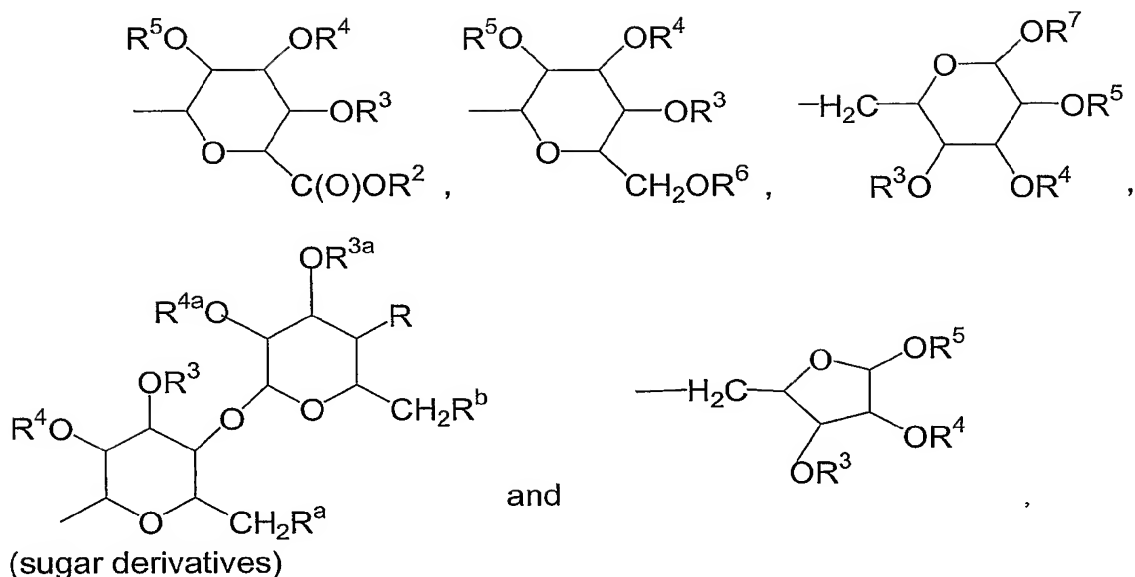


or a pharmaceutically acceptable salt or solvate thereof, wherein in Formula (IX):

$R^1$  is selected from the group consisting of H, G, G<sup>1</sup>, G<sup>2</sup>, -SO<sub>3</sub>H and -PO<sub>3</sub>H;

G is selected from the group consisting of: H,

- 23 -



wherein R, R<sup>a</sup> and R<sup>b</sup> are each independently selected from the group consisting of H, -OH, halo, -NH<sub>2</sub>, azido, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)alkoxy or -W-R<sup>30</sup>;

W is independently selected from the group consisting of  
 5 -NH-C(O)-, -O-C(O)-, -O-C(O)-N(R<sup>31</sup>)-, -NH-C(O)-N(R<sup>31</sup>)- and  
 -O-C(S)-N(R<sup>31</sup>)-;

R<sup>2</sup> and R<sup>6</sup> are each independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, acetyl, aryl and aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

10 R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>7</sup>, R<sup>3a</sup> and R<sup>4a</sup> are each independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, acetyl, aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)(C<sub>1</sub>-C<sub>6</sub>)alkyl and -C(O)aryl;

R<sup>30</sup> is independently selected from the group consisting of  
 R<sup>32</sup>-substituted T, R<sup>32</sup>-substituted-T-(C<sub>1</sub>-C<sub>6</sub>)alkyl, R<sup>32</sup>-substituted-(C<sub>2</sub>-C<sub>4</sub>)alkenyl,  
 R<sup>32</sup>-substituted-(C<sub>1</sub>-C<sub>6</sub>)alkyl, R<sup>32</sup>-substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl and R<sup>32</sup>-substituted-  
 15 (C<sub>3</sub>-C<sub>7</sub>)cycloalkyl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>31</sup> is independently selected from the group consisting of H and (C<sub>1</sub>-C<sub>4</sub>)alkyl;

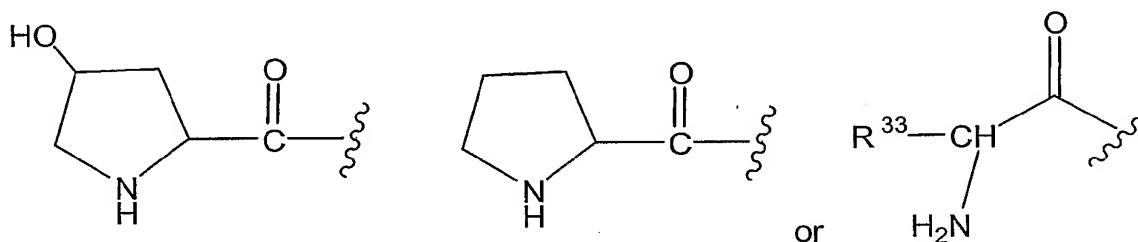
T is independently selected from the group consisting of phenyl, furyl, thienyl, pyrrolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, benzothiazolyl, thiadiazolyl, pyrazolyl, imidazolyl and pyridyl;



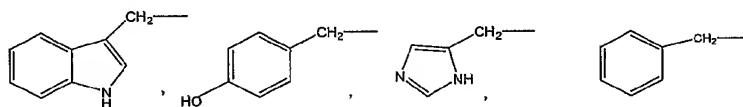
- 24 -

$R^{32}$  is independently selected from 1-3 substituents which are each independently selected from the group consisting of H, halo, (C1-C4)alkyl, -OH, phenoxy, -CF<sub>3</sub>, -NO<sub>2</sub>, (C1-C4)alkoxy, methylenedioxy, oxo, (C1-C4)alkylsulfanyl, (C1-C4)alkylsulfinyl, (C1-C4)alkylsulfonyl, -N(CH<sub>3</sub>)<sub>2</sub>, -C(O)-NH(C1-C4)alkyl, -C(O)-N((C1-C4)alkyl)<sub>2</sub>, -C(O)-(C1-C4)alkyl, -C(O)-(C1-C4)alkoxy and pyrrolidinylcarbonyl; or  $R^{32}$  is a covalent bond and  $R^{31}$ , the nitrogen to which it is attached and  $R^{32}$  form a pyrrolidinyl, piperidinyl, N-methyl-piperazinyl, indolyl or morpholinyl group, or a (C1-C4)alkoxycarbonyl-substituted pyrrolidinyl, piperidinyl, N-methylpiperazinyl, indolyl or morpholinyl group;

$G^1$  is represented by the structure:



wherein  $R^{33}$  is independently selected from the group consisting of unsubstituted alkyl,  $R^{34}$ -substituted alkyl,  $(R^{35})(R^{36})$ alkyl-,

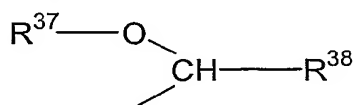


$R^{34}$  is one to three substituents, each  $R^{34}$  being independently selected from the group consisting of HOOC-, HO-, HS-, (CH<sub>3</sub>)S-, H<sub>2</sub>N-, (NH<sub>2</sub>)(NH)C(NH)-, (NH<sub>2</sub>)C(O)- and HOOCCH(NH<sub>3</sub><sup>+</sup>)CH<sub>2</sub>SS-;

$R^{35}$  is independently selected from the group consisting of H and NH<sub>2</sub>;

$R^{36}$  is independently selected from the group consisting of H, unsubstituted alkyl,  $R^{34}$ -substituted alkyl, unsubstituted cycloalkyl and  $R^{34}$ -substituted cycloalkyl;

$G^2$  is represented by the structure:



- 25 -

wherein  $R^{37}$  and  $R^{38}$  are each independently selected from the group consisting of (C<sub>1</sub>-C<sub>6</sub>)alkyl and aryl;

$R^{26}$  is one to five substituents, each  $R^{26}$  being independently selected from the group consisting of:

- a) H;
- b) -OH;
- c) -OCH<sub>3</sub>;
- d) fluorine;
- e) chlorine;
- f) -O-G;
- g) -O-G<sup>1</sup>;
- h) -O-G<sup>2</sup>;
- i) -SO<sub>3</sub>H; and
- j) -PO<sub>3</sub>H;

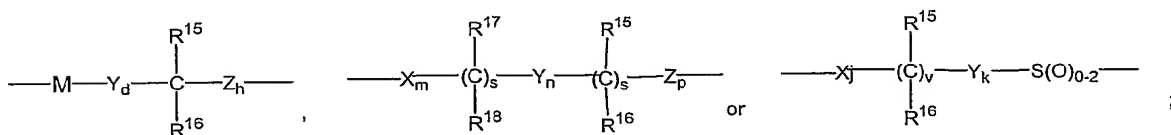
provided that when  $R^1$  is H,  $R^{26}$  is not H, -OH, -OCH<sub>3</sub> or -O-G;

Ar<sup>1</sup> is aryl, R<sup>10</sup>-substituted aryl, heteroaryl or R<sup>10</sup>-substituted heteroaryl;

Ar<sup>2</sup> is aryl, R<sup>11</sup>-substituted aryl, heteroaryl or R<sup>11</sup>-substituted heteroaryl;

L is selected from the group consisting of:

- a) a covalent bond;
- b) -(CH<sub>2</sub>)<sub>q</sub>-, wherein q is 1-6;
- c) -(CH<sub>2</sub>)<sub>e</sub>-E-(CH<sub>2</sub>)<sub>r</sub>-, wherein E is -O-, -C(O)-, phenylene, -NR<sup>22</sup>- or -S(O)<sub>0-2</sub>-, e is 0-5 and r is 0-5, provided that the sum of e and r is 1-6;
- d) -(C<sub>2</sub>-C<sub>6</sub>)alkenylene-;
- e) -(CH<sub>2</sub>)<sub>f</sub>-V-(CH<sub>2</sub>)<sub>g</sub>-, wherein V is C<sub>3</sub>-C<sub>6</sub>cycloalkylene, f is 1-5 and g is 0-5, provided that the sum of f and g is 1-6; and
- f)



wherein M is -O-, -S-, -S(O)- or -S(O)<sub>2</sub>-;

X, Y and Z are each independently selected from the group consisting of

- 26 -

-CH<sub>2</sub>-, -CH(C<sub>1</sub>-C<sub>6</sub>)alkyl- and -C(di-(C<sub>1</sub>-C<sub>6</sub>)alkyl)-;

R<sup>8</sup> is selected from the group consisting of H and alkyl;

R<sup>10</sup> and R<sup>11</sup> are each independently selected from the group consisting of 1-3 substituents which are each independently selected from the group consisting of (C<sub>1</sub>-C<sub>6</sub>)alkyl, -OR<sup>19</sup>, -O(CO)R<sup>19</sup>, -O(CO)OR<sup>21</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>19</sup>, -O(CO)NR<sup>19</sup>R<sup>20</sup>, -NR<sup>19</sup>R<sup>20</sup>, -NR<sup>19</sup>(CO)R<sup>20</sup>, -NR<sup>19</sup>(CO)OR<sup>21</sup>, -NR<sup>19</sup>(CO)NR<sup>20</sup>R<sup>25</sup>, -NR<sup>19</sup>SO<sub>2</sub>R<sup>21</sup>, -COOR<sup>19</sup>, -CONR<sup>19</sup>R<sup>20</sup>, -COR<sup>19</sup>, -SO<sub>2</sub>NR<sup>19</sup>R<sup>20</sup>, S(O)<sub>0-2</sub>R<sup>21</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>19</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>19</sup>R<sup>20</sup>, -(C<sub>1</sub>-C<sub>6</sub> alkylene)-COOR<sup>19</sup>, -CH=CH-COOR<sup>19</sup>, -CF<sub>3</sub>, -CN, -NO<sub>2</sub> and halo;

R<sup>15</sup> and R<sup>17</sup> are each independently selected from the group consisting of -OR<sup>19</sup>, -OC(O)R<sup>19</sup>, -OC(O)OR<sup>21</sup>, -OC(O)NR<sup>19</sup>R<sup>20</sup>;

R<sup>16</sup> and R<sup>18</sup> are each independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl and aryl;

or R<sup>15</sup> and R<sup>16</sup> together are =O, or R<sup>17</sup> and R<sup>18</sup> together are =O;

d is 1, 2 or 3;

h is 0, 1, 2, 3 or 4;

s is 0 or 1;

t is 0 or 1;

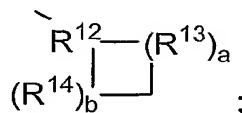
m, n and p are each independently selected from 0-4;

provided that at least one of s and t is 1, and the sum of m, n, p, s and t is 1-6; provided that when p is 0 and t is 1, the sum of m, n and p is 1-5; and provided that when p is 0 and s is 1, the sum of m, t and n is 1-5;

v is 0 or 1;

j and k are each independently 1-5, provided that the sum of j, k and v is 1-5;

Q is a bond, -(CH<sub>2</sub>)<sub>q</sub>-, wherein q is 1-6, or, with the 3-position ring carbon of the azetidinone, forms the spiro group



wherein R<sup>12</sup> is

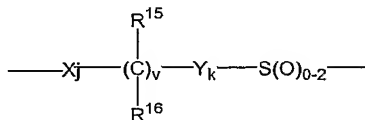
- 27 -

$\text{-}\overset{|}{\text{CH}}\text{-}$ ,  $\text{-}\overset{|}{\text{C}}(\text{C}_1\text{-C}_6 \text{ alkyl})\text{-}$ ,  $\text{-}\overset{|}{\text{CF}}\text{-}$ ,  $\text{-}\overset{|}{\text{C}}(\text{OH})\text{-}$ ,  $\text{-}\overset{|}{\text{C}}(\text{C}_6\text{H}_4\text{-R}^{23})\text{-}$ ,  $\text{-}\overset{|}{\text{N}}\text{-}$ , or  $\text{-}\overset{|}{\text{N}}\text{O}^+\text{-}$  ;

$\text{R}^{13}$  and  $\text{R}^{14}$  are each independently selected from the group consisting of  $\text{-CH}_2\text{-}$ ,  $\text{-CH}(\text{C}_1\text{-C}_6 \text{ alkyl})\text{-}$ ,  $\text{-C}(\text{di}-(\text{C}_1\text{-C}_6) \text{ alkyl})\text{-}$ ,  $\text{-CH=CH-}$  and  $\text{-C}(\text{C}_1\text{-C}_6 \text{ alkyl})=\text{CH-}$ ; or  $\text{R}^{12}$  together with an adjacent  $\text{R}^{13}$ , or  $\text{R}^{12}$  together with an adjacent  $\text{R}^{14}$ , form a -  
 5  $\text{CH=CH-}$  or a  $\text{-CH=C}(\text{C}_1\text{-C}_6 \text{ alkyl})\text{-}$  group;

a and b are each independently 0, 1, 2 or 3, provided both are not zero;  
 provided that when  $\text{R}^{13}$  is  $\text{-CH=CH-}$  or  $\text{-C}(\text{C}_1\text{-C}_6 \text{ alkyl})=\text{CH-}$ , a is 1; provided that  
 when  $\text{R}^{14}$  is  $\text{-CH=CH-}$  or  $\text{-C}(\text{C}_1\text{-C}_6 \text{ alkyl})=\text{CH-}$ , b is 1; provided that when a is 2 or 3,  
 the  $\text{R}^{13}$ 's can be the same or different; and provided that when b is 2 or 3, the  $\text{R}^{14}$ 's  
 10 can be the same or different;

and when Q is a bond and L is



15 then  $\text{Ar}^1$  can also be pyridyl, isoxazolyl, furanyl, pyrrolyl, thienyl, imidazolyl, pyrazolyl, thiazolyl, pyrazinyl, pyrimidinyl or pyridazinyl;

$\text{R}^{19}$  and  $\text{R}^{20}$  are each independently selected from the group consisting of H,  $(\text{C}_1\text{-C}_6)\text{alkyl}$ , aryl and aryl-substituted  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ;

20  $\text{R}^{21}$  is  $(\text{C}_1\text{-C}_6)\text{alkyl}$ , aryl or  $\text{R}^{24}$ -substituted aryl;

$\text{R}^{22}$  is H,  $(\text{C}_1\text{-C}_6)\text{alkyl}$ , aryl  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ,  $\text{-C(O)R}^{19}$  or  $\text{-COOR}^{19}$ ;

$\text{R}^{23}$  and  $\text{R}^{24}$  are each independently selected from the group consisting of 1-3 substituents which are each independently selected from the group consisting of H,  $(\text{C}_1\text{-C}_6)\text{alkyl}$ ,  $(\text{C}_1\text{-C}_6)\text{alkoxy}$ ,  $\text{-COOH}$ ,  $\text{NO}_2$ ,  $\text{-NR}^{19}\text{R}^{20}$ ,  $\text{-OH}$  and halo; and

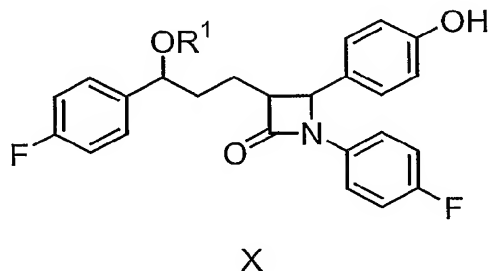
25  $\text{R}^{25}$  is H,  $\text{-OH}$  or  $(\text{C}_1\text{-C}_6)\text{alkoxy}$ .

Examples of compounds of Formula (IX) which are useful in the methods and combinations of the present invention and methods for making such compounds are

- 28 -

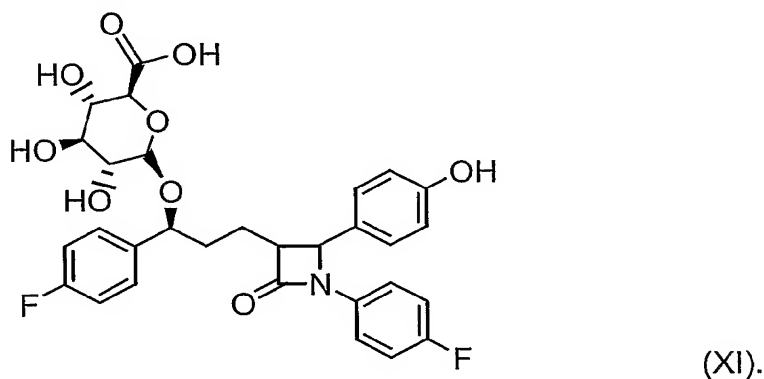
disclosed in U.S. Patent Application Serial No. 10/166,942, filed June 11, 2002, incorporated herein by reference.

An example of a useful compound of this invention is one represented by the formula X:

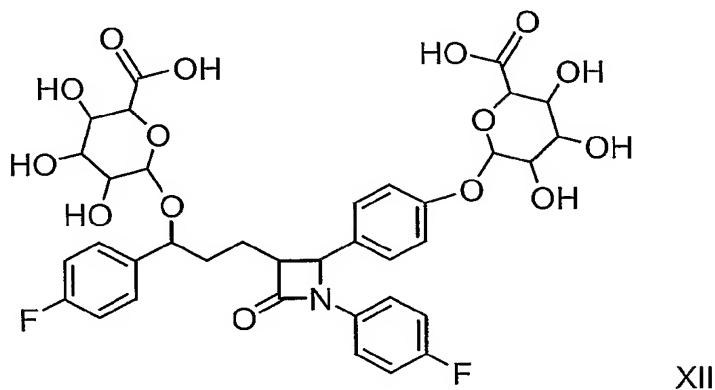


wherein R<sup>1</sup> is defined as above.

A more preferred compound is one represented by formula XI:



Another useful compound is represented by Formula XII:



Other useful substituted azetidinone compounds include N-sulfonyl-2-azetidinones such as are disclosed in U.S. Patent No. 4,983,597, ethyl 4-(2-oxoazetidin-4-yl)phenoxy-alkanoates such as are disclosed in Ram et al., Indian J.

Chem. Sect. B. 29B, 12 (1990), p. 1134-7, and diphenyl azetidinones and derivatives disclosed in U.S. Patent Publication Nos. 2002/0039774, 2002/0128252, 2002/0128253 and 2002/0137689, and WO 2002/066464, each of which is incorporated by reference herein.

5           The compounds of Formulae I-XII can be prepared by known methods, including the methods discussed above and, for example, WO 93/02048 describes the preparation of compounds wherein -R<sup>1</sup>-Q- is alkylene, alkenylene or alkylene interrupted by a hetero atom, phenylene or cycloalkylene; WO 94/17038 describes the preparation of compounds wherein Q is a spirocyclic group; WO 95/08532  
10 describes the preparation of compounds wherein -R<sup>1</sup>-Q- is a hydroxy-substituted alkylene group; PCT/US95/03196 describes compounds wherein -R<sup>1</sup>-Q- is a hydroxy-substituted alkylene attached to the Ar<sup>1</sup> moiety through an -O- or S(O)<sub>0-2</sub>- group; and U.S. Serial No. 08/463,619, filed June 5, 1995, describes the preparation of compounds wherein -R<sup>1</sup>-Q- is a hydroxy-substituted alkylene group attached the  
15 azetidinone ring by a -S(O)<sub>0-2</sub>- group.

Compounds of the invention have at least one asymmetrical carbon atom and therefore all isomers, including enantiomers, stereoisomers, rotamers, tautomers and racemates of the compounds of Formulae I-XII are contemplated as being part of this invention. The invention includes d and l isomers in both pure form and in admixture,  
20 including racemic mixtures. Isomers can be prepared using conventional techniques, either by reacting optically pure or optically enriched starting materials or by separating isomers of a compound of the Formulae I-XII. Isomers may also include geometric isomers, e.g., when a double bond is present.

Those skilled in the art will appreciate that for some of the compounds of the  
25 Formulas I-XII, one isomer will show greater pharmacological activity than other isomers.

Compounds of the invention with an amino group can form pharmaceutically acceptable salts with organic and inorganic acids. Examples of suitable acids for salt formation are hydrochloric, sulfuric, phosphoric, acetic, citric, oxalic, malonic, salicylic,  
30 malic, fumaric, succinic, ascorbic, maleic, methanesulfonic and other mineral and carboxylic acids well known to those in the art. The salt is prepared by contacting the

- 30 -

free base form with a sufficient amount of the desired acid to produce a salt. The free base form may be regenerated by treating the salt with a suitable dilute aqueous base solution such as dilute aqueous sodium bicarbonate. The free base form differs from its respective salt form somewhat in certain physical properties, such as solubility in polar solvents, but the salt is otherwise equivalent to its respective free base forms for purposes of the invention.

Certain compounds of the invention are acidic (e.g., those compounds which possess a carboxyl group). These compounds form pharmaceutically acceptable salts with inorganic and organic bases. Examples of such salts are the sodium, potassium, calcium, aluminum, gold and silver salts. Also included are salts formed with pharmaceutically acceptable amines such as ammonia, alkyl amines, hydroxyalkylamines, N-methylglucamine and the like.

As used herein, "solvate" means a molecular or ionic complex of molecules or ions of solvent with those of solute (for example, one or more compounds of Formulae I-XII, isomers of the compounds of Formulae I-XII, or prodrugs of the compounds of Formulae I-XII). Non-limiting examples of useful solvents include polar, protic solvents such as water and/or alcohols (for example methanol).

Prodrugs of the compounds of Formulae I-XII are contemplated as being part of this invention. As used herein, "prodrug" means compounds that are drug precursors which, following administration to a patient, release the drug *in vivo* via some chemical or physiological process (e.g., a prodrug on being brought to the physiological pH or through enzyme action is converted to the desired drug form).

The daily dose of the sterol absorption inhibitor(s) administered to the subject can range from about 0.1 to about 1000 mg per day, preferably about 0.25 to about 50 mg/day, and more preferably about 10 mg per day, given in a single dose or 2-4 divided doses. The exact dose, however, is determined by the attending clinician and is dependent on the potency of the compound administered, the age, weight, condition and response of the patient.

For administration of pharmaceutically acceptable salts of the above compounds, the weights indicated above refer to the weight of the acid equivalent or the base equivalent of the therapeutic compound derived from the salt.

- 31 -

The term "therapeutically effective amount" means that amount of a therapeutic agent of the composition, such as a sterol absorption inhibitor(s), antidemyelination agent and other pharmacological or therapeutic agents described below, that will elicit a biological or medical response of a tissue, system, or subject that is being sought by the administrator (such as a researcher, doctor or veterinarian) which includes alleviation of the symptoms of the condition or disease being treated and the prevention, slowing or halting of progression of the condition (demyelination and its symptom(s)).

Examples of suitable subjects that can be treated according to the methods of the present invention include mammals, such as humans or dogs, and other animals.

As used herein, "combination therapy" or "therapeutic combination" means the administration of two or more therapeutic agents, such as sterol absorption inhibitor(s) and antidemyelination agent(s), to prevent or treat demyelination or any of its associated conditions, such as are discussed above. As used herein, "demyelination" means insufficient or loss of myelin on the nerves. Such administration includes coadministration of these therapeutic agents in a substantially simultaneous manner, such as in a single tablet or capsule having a fixed ratio of active ingredients or in multiple, separate capsules for each therapeutic agent. Also, such administration includes use of each type of therapeutic agent in a sequential manner. In either case, the treatment using the combination therapy will provide beneficial effects in treating the demyelination condition. A potential advantage of the combination therapy disclosed herein may be a reduction in the required amount of an individual therapeutic compound or the overall total amount of therapeutic compounds that are effective in treating the demyelination condition. By using a combination of therapeutic agents, the side effects of the individual compounds can be reduced as compared to a monotherapy, which can improve patient compliance. Also, therapeutic agents can be selected to provide a broader range of complimentary effects or complimentary modes of action.

In another embodiment, the present invention provides a therapeutic combination comprising (a) a first amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt thereof or a solvate thereof; and (b) a second amount of at least one antidemyelination agent or treatment, wherein the first amount



- 32 -

and the second amount together comprise a therapeutically effective amount for the treatment or prevention of demyelination or lessening or amelioration of one or more symptoms of a condition associated with demyelination.

In another embodiment, the present invention provides a pharmaceutical composition for the treatment or prevention of diabetes and/or lowering a concentration of a sterol in plasma of a subject, comprising a therapeutically effective amount of a composition comprising (a) a first amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt thereof or a solvate thereof; (b) a second amount of at least one antidemyelination agent and (c) a pharmaceutically acceptable carrier.

In another embodiment, the present invention provides a method of treating or preventing demyelination in a subject, comprising the step of administering to a subject in need of such treatment an effective amount of a composition comprising (a) a first amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt thereof or a solvate thereof; and (b) a second amount of at least one antidemyelination agent to prevent or treat demyelination or any of its symptoms in the subject.

Useful antidemyelination agents include beta-interferon (such as AVONEX® which is available from Biogen, Inc. and BETASERON® which is available from Berlex Laboratories), which can decrease the frequency and occurrence of flare-ups and slow the progression to disability, glatiramer acetate (such as COPAXONE® which is available from Teva Neuroscience, Inc.), which can reduce the frequency of relapses, and/or administration of corticosteroids, such as prednisone (available from Roxane), to relieve acute symptoms. The amount of respective antidemyelination agent to be administered to the subject readily can be determined by one skilled in the art from the Physician's Desk Reference (56<sup>th</sup> Ed. 2002) at pages 1013-1016, 988-995, 3306-3310 and 3064-3066, incorporated herein by reference.

Also useful with the present invention are compositions or therapeutic combinations that can further comprise one or more pharmacological or therapeutic agents or drugs such as cholesterol biosynthesis inhibitors and/or lipid-lowering agents discussed below.

- 33 -

Non-limiting examples of cholesterol biosynthesis inhibitors for use in the compositions, therapeutic combinations and methods of the present invention include competitive inhibitors of HMG CoA reductase, the rate-limiting step in cholesterol biosynthesis, squalene synthase inhibitors, squalene epoxidase inhibitors and mixtures thereof. Non-limiting examples of suitable HMG CoA reductase inhibitors include statins such as atorvastatin (for example LIPITOR® which is available from Pfizer), lovastatin (for example MEVACOR® which is available from Merck & Co.), pravastatin (for example PRAVACHOL® which is available from Bristol Meyers Squibb), fluvastatin, simvastatin (for example ZOCOR® which is available from Merck & Co.), cerivastatin, CI-981, rivastatin (sodium 7-(4-fluorophenyl)-2,6-diisopropyl-5-methoxymethylpyridin-3-yl)-3,5-dihydroxy-6-heptanoate) and pitavastatin (such as NK-104 of Negma Kowa of Japan). Preferred HMG CoA reductase inhibitors include atorvastatin and simvastatin. Generally, a total daily dosage of cholesterol biosynthesis inhibitor(s) can range from about 0.1 to about 160 mg per day, and preferably about 0.2 to about 80 mg/day in single or 2-3 divided doses.

Also useful with the present invention are compositions or therapeutic combinations that can further comprise at least one (one or more) activators for peroxisome proliferator-activated receptors (PPAR), such as peroxisome proliferator-activated receptor alpha (PPAR $\alpha$ ), peroxisome proliferator-activated receptor gamma (PPAR $\gamma$ ) and peroxisome proliferator-activated receptor delta (PPAR $\delta$ ). PPAR $\alpha$  activator compounds are useful for, among other things, lowering triglycerides, moderately lowering LDL levels and increasing HDL levels. Useful examples of PPAR $\alpha$  activators include fibrates, such as clofibrate, gemfibrozil and fenofibrate. The PPAR activator(s) are administered in a therapeutically effective amount to treat the specified condition, for example in a daily dose preferably ranging from about 50 to about 3000 mg per day.

The compositions, therapeutic combinations or methods of the present invention can further comprise one or more bile acid sequestrants such as cholestyramine, colestipol and colesevelam hydrochloride. Generally, a total daily dosage of bile acid sequestrant(s) can range from about 1 to about 50 grams per day, and preferably about 2 to about 16 grams per day in single or 2-4 divided doses.

- 34 -

The compositions or treatments of the present invention can further comprise one or more ileal bile acid transport ("IBAT") inhibitors (or apical sodium co-dependent bile acid transport ("ASBT") inhibitors) coadministered with or in combination with the peroxisome proliferator-activated receptor activator(s) and sterol absorption inhibitor(s) discussed above. The IBAT inhibitors can inhibit bile acid transport to reduce LDL cholesterol levels. Non-limiting examples of suitable IBAT inhibitors include benzothiepienes such as are disclosed in PCT Patent Application WO 00/38727 which is incorporated herein by reference. Generally, a total daily dosage of IBAT inhibitor(s) can range from about 0.01 to about 1000 mg/day, and preferably about 0.1 to about 50 mg/day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise nicotinic acid (niacin) and/or derivatives thereof, such as NIASPAN® (niacin extended-release tablets) which are available from Kos. Generally, a total daily dosage of nicotinic acid or a derivative thereof can range from about 500 to about 10,000 mg/day, preferably about 1000 to about 8000 mg/day, and more preferably about 3000 to about 6000 mg/day in single or divided doses.

The compositions or treatments of the present invention can further comprise one or more AcylCoA:Cholesterol O-acyltransferase ("ACAT") Inhibitors, which can reduce LDL and VLDL levels. Non-limiting examples of useful ACAT inhibitors include avasimibe. Generally, a total daily dosage of ACAT inhibitor(s) can range from about 0.1 to about 1000 mg/day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise one or more Cholesteryl Ester Transfer Protein ("CETP") Inhibitors. CETP is responsible for the exchange or transfer of cholesteryl ester carrying HDL and triglycerides in VLDL. Non-limiting examples of suitable CETP inhibitors are disclosed in PCT Patent Application No. WO 00/38721 and U.S. Patent No. 6,147,090, which are incorporated herein by reference. Generally, a total daily dosage of CETP inhibitor(s) can range from about 0.01 to about 1000 mg/day, and preferably about 0.5 to about 20 mg/kg body weight/day in single or divided doses.

The compositions or treatments of the present invention can further comprise probucol or derivatives thereof, which can reduce LDL levels. Generally, a total daily dosage of probucol or derivatives thereof can range from about 10 to about 2000

mg/day, and preferably about 500 to about 1500 mg/day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise low-density lipoprotein (LDL) receptor activators such as HOE-402, an imidazolidinyl-pyrimidine derivative that directly stimulates LDL receptor activity. Generally, a total  
5 daily dosage of LDL receptor activator(s) can range from about 1 to about 1000 mg/day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise fish oil, which contains Omega 3 fatty acids (3-PUFA), which can reduce VLDL and  
10 triglyceride levels. Generally, a total daily dosage of fish oil or Omega 3 fatty acids can range from about 1 to about 30 grams per day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise natural water soluble fibers, such as psyllium, guar, oat and pectin, which can reduce cholesterol levels. Generally, a total daily dosage of natural water soluble fibers can  
15 range from about 0.1 to about 10 grams per day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise plant sterols, plant stanols and/or fatty acid esters of plant stanols, such as sitostanol ester used in BENECOL® margarine, which can reduce cholesterol levels. Generally,  
20 a total daily dosage of plant sterols, plant stanols and/or fatty acid esters of plant stanols can range from about 0.5 to about 20 grams per day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise antioxidants, such as probucol, tocopherol, ascorbic acid,  $\beta$ -carotene and selenium, or vitamins such as vitamin B<sub>6</sub> or vitamin B<sub>12</sub>. Generally, a total daily dosage of  
25 antioxidants or vitamins can range from about 0.05 to about 10 grams per day in single or 2-4 divided doses.

The compositions or treatments of the present invention can further comprise monocyte and macrophage inhibitors such as polyunsaturated fatty acids, gene therapy and use of recombinant proteins such as recombinant apo E. Generally, a  
30 total daily dosage of these agents can range from about 0.01 to about 1000 mg/day in single or 2-4 divided doses.

The compositions, therapeutic combinations or methods of the present

invention can further comprise one or more cardiovascular agents or blood modifiers.

Mixtures of any of the pharmacological or therapeutic agents described above can be used in the compositions and therapeutic combinations of these other embodiments of the present invention.

5           The compositions and therapeutic combinations of the present invention can be administered to a subject in need of such treatment in a therapeutically effective amount to treat demyelination and its associated conditions as discussed above. The compositions and treatments can be administered by any suitable means which produce contact of these compounds with the site of action in the body, for example in  
10   the plasma, liver or small intestine of a subject.

          The daily dosage for the various compositions and therapeutic combinations described above can be administered to a subject in a single dose or in multiple subdoses, as desired. Subdoses can be administered 2 to 6 times per day, for example. Sustained release dosages can be used. Where the antidemyelination  
15   agent and sterol absorption inhibitor(s) are administered in separate dosages, the number of doses of each component given per day may not necessarily be the same, e.g., one component may have a greater duration of activity and will therefore need to be administered less frequently.

          The compositions, therapeutic combinations or medicaments of the present  
20   invention can further comprise one or more pharmaceutically acceptable carriers, one or more excipients and/or one or more additives. The pharmaceutical compositions can comprise about 1 to about 99 weight percent of active ingredient (such as one or more compounds of Formula I-XII), and preferably about 5 to about 95 percent active ingredient.

25           Useful pharmaceutically acceptable carriers can be either solid, liquid or gas. Non-limiting examples of pharmaceutically acceptable carriers include solids and/or liquids such as magnesium carbonate, magnesium stearate, talc, sugar, lactose, ethanol, glycerol, water and the like. The amount of carrier in the treatment composition or therapeutic combination can range from about 5 to about 99 weight  
30   percent of the total weight of the treatment composition or therapeutic combination. Non-limiting examples of suitable pharmaceutically acceptable excipients and additives include non-toxic compatible fillers, binders such as starch, polyvinyl

- 37 -

pyrrolidone or cellulose ethers, disintegrants such as sodium starch glycolate, crosslinked polyvinyl pyrrolidone or croscarmellose sodium, buffers, preservatives, anti-oxidants, lubricants, flavorings, thickeners, coloring agents, wetting agents such as sodium lauryl sulfate, emulsifiers and the like. The amount of excipient or additive can range from about 0.1 to about 95 weight percent of the total weight of the treatment composition or therapeutic combination. One skilled in the art would understand that the amount of carrier(s), excipients and additives (if present) can vary. Further examples of pharmaceutically acceptable carriers and methods of manufacture for various compositions can be found in A. Gennaro (ed.), Remington: The Science and Practice of Pharmacy, 20<sup>th</sup> Edition, (2000), Lippincott Williams & Wilkins, Baltimore, MD.

Useful solid form preparations include powders, tablets, dispersible granules, capsules, cachets and suppositories. An example of a preparation of a preferred solid form dosage formulation is provided below.

Useful liquid form preparations include solutions, suspensions and emulsions. As an example may be mentioned water or water-propylene glycol solutions for parenteral injection or addition of sweeteners and opacifiers for oral solutions, suspensions and emulsions. Liquid form preparations may also include solutions for intranasal administration.

Aerosol preparations suitable for inhalation may include solutions and solids in powder form, which may be in combination with a pharmaceutically acceptable carrier, such as an inert compressed gas, e.g. nitrogen.

Also useful are solid form preparations which are intended to be converted, shortly before use, to liquid form preparations for either oral or parenteral administration. Such liquid forms include solutions, suspensions and emulsions.

The compounds of the invention may also be deliverable transdermally. The transdermal compositions can take the form of creams, lotions, aerosols and/or emulsions and can be included in a transdermal patch of the matrix or reservoir type as are conventional in the art for this purpose.

Preferably the compound is administered orally.

In another embodiment, the present invention provides the use of at least one compound represented by Formulae (I-XII) for manufacture of a medicament (such as

- 38 -

one of the compositions discussed above) for the treatment of demyelination and its associated conditions.

The following formulation exemplifies one of the dosage forms of this invention. In the formulation, the term "Active Compound I" designates a sterol absorption inhibitor such as any of the compounds of Formulas I-XII described herein above and the term "Active Compound II" designates an antidemyelination agent described herein above.

#### EXAMPLE

<u>Tablets</u>		
<u>No.</u>	<u>Ingredient</u>	<u>mg/tablet</u>
1	Active Compound I	10
2	Lactose monohydrate NF	55
3	Microcrystalline cellulose NF	20
4	Povidone USP (K29-32)	4
5	Croscarmellose sodium NF	8
6	Sodium lauryl sulfate NF	2
7	Magnesium stearate NF	1
	Total	100

In the present invention, the above-described tablet can be coadministered with an injection, tablet, capsule, etc. comprising a dosage of Active Compound II as described above.

#### Method of Manufacture

Mix Item No. 4 with purified water in suitable mixer to form binder solution. Spray the binder solution and then water over Items 1, 2 and 6 and a portion of item 5 in a fluidized bed processor to granulate the ingredients. Continue fluidization to dry the damp granules. Screen the dried granule and blend with Item No. 3 and the remainder of Item No. 5. Add Item No. 7 and mix. Compress the mixture to appropriate size and weight on a suitable tablet machine.

- 39 -

For coadministration in separate tablets or capsules, representative formulations comprising a sterol absorption inhibitor such as are discussed above are well known in the art and representative formulations comprising an antidemyelination agent such as are discussed above are well known in the art. It is contemplated that where the two active ingredients are administered as a single composition, the dosage forms disclosed above for sterol absorption inhibitors may readily be modified using the knowledge of one skilled in the art.

Since the present invention relates to treating demyelination by treatment with a combination of active ingredients wherein the active ingredients may be administered separately, the invention also relates to combining separate pharmaceutical compositions in kit form. That is, a kit is contemplated wherein two separate units are combined: a pharmaceutical composition comprising at least one antidemyelination medication and a separate pharmaceutical composition comprising at least one sterol absorption inhibitor as described above. The kit will preferably include directions for the administration of the separate components. The kit form is particularly advantageous when the separate components must be administered in different dosage forms (e.g., oral and parenteral) or are administered at different dosage intervals.

The treatment compositions and therapeutic combinations of the present invention can inhibit the intestinal absorption of sterols in subjects and can be useful in the treatment and/or prevention of demyelination and associated conditions, such as multiple sclerosis, in subjects, in particular in mammals.

The compositions and therapeutic combinations of the present invention can reduce plasma concentration of at least one sterol selected from the group consisting of cholesterol, phytosterols (such as sitosterol, campesterol, stigmasterol and avenosterol), and/or  $5\alpha$ -stanols (such as cholestanol,  $5\alpha$ -campestanol,  $5\alpha$ -sitostanol), and mixtures thereof. The plasma concentration can be reduced by administering to a subject in need of such treatment an effective amount of at least one treatment composition comprising at least one sterol or  $5\alpha$ -stanol absorption inhibitor described above. The reduction in plasma concentration of sterols or  $5\alpha$ -stanols can range from about 1 to about 70 percent, and preferably about 10 to about 50 percent. Methods of measuring serum total blood cholesterol and total LDL cholesterol are well known to



- 40 -

those skilled in the art and for example include those disclosed in PCT WO 99/38498 at page 11, incorporated by reference herein. Methods of determining levels of other sterols in serum are disclosed in H. Gylling et al., "Serum Sterols During Stanol Ester Feeding in a Mildly Hypercholesterolemic Population", J. Lipid Res. 40: 593-600 (1999), incorporated by reference herein.

These sterol absorption inhibitors can be useful in treating or preventing vascular inflammation. Vascular stimuli to mammals, such as cellular injury or inflammation, may lead to the production of various proteins, commonly called acute response proteins, in the body. One particular type of acute phase protein is C-reactive protein (CRP). Manufactured in the liver and deposited in damaged tissue, CRP is found in high levels in inflammatory fluids and in both the intimal layer of the atherosclerotic artery and within the lesions of atherosclerotic plaque. These sterol absorption inhibitors can be useful for lowering or controlling c-reactive protein blood levels in a subject to less than about 3.4 mg/dL. Preferably, the C-reactive protein blood levels in a subject are reduced or controlled to less than 1.0 mg/dL by the methods of the present invention. More preferably, the C-reactive protein blood levels in a subject are reduced or controlled to less than 0.4 mg/dL by the methods of the present invention. C-reactive protein assays and methodologies for the same are available from Behring Diagnostics Inc., of Somerville, NJ. Moreover, methods for analyzing c-reactive proteins are described in U.S. Patents Nos. 5,358,852; 6,040,147; and 6,277,584, whose contents are incorporated herein by reference.

Illustrating the invention is the following example of preparation of a compound of Formula II which, however, is not to be considered as limiting the invention to their details. Unless otherwise indicated, all parts and percentages in the following examples, as well as throughout the specification, are by weight.

### **EXAMPLE**

#### **PREPARATION OF COMPOUND OF FORMULA (II)**

Step 1): To a solution of (S)-4-phenyl-2-oxazolidinone (41 g, 0.25 mol) in CH<sub>2</sub>Cl<sub>2</sub> (200 ml), was added 4-dimethylaminopyridine (2.5 g, 0.02 mol) and

- 41 -

triethylamine (84.7 ml, 0.61 mol) and the reaction mixture was cooled to 0°C. Methyl-4-(chloroformyl)butyrate (50 g, 0.3 mol) was added as a solution in CH<sub>2</sub>Cl<sub>2</sub> (375 ml) dropwise over 1 h, and the reaction was allowed to warm to 22°C. After 17 h, water and H<sub>2</sub>SO<sub>4</sub> (2N, 100 ml), was added the layers were separated, and the organic layer was washed sequentially with NaOH (10%), NaCl (sat'd) and water. The organic layer was dried over MgSO<sub>4</sub> and concentrated to obtain a semicrystalline product.

Step 2): To a solution of TiCl<sub>4</sub> (18.2 ml, 0.165 mol) in CH<sub>2</sub>Cl<sub>2</sub> (600 ml) at 0°C, was added titanium isopropoxide (16.5 ml, 0.055 mol). After 15 min, the product of Step 1 (49.0 g, 0.17 mol) was added as a solution in CH<sub>2</sub>Cl<sub>2</sub> (100 ml). After 5 min., diisopropylethylamine (DIPEA) (65.2 ml, 0.37 mol) was added and the reaction mixture was stirred at 0°C for 1 h, the reaction mixture was cooled to -20°C, and 4-benzyloxybenzylidene(4-fluoro)aniline (114.3 g, 0.37 mol) was added as a solid. The reaction mixture was stirred vigorously for 4 h at -20°C, then acetic acid was added as a solution in CH<sub>2</sub>Cl<sub>2</sub> dropwise over 15 min, the reaction mixture was allowed to warm to 0°C, and H<sub>2</sub>SO<sub>4</sub> (2N) was added. The reaction mixture was stirred an additional 1 h, the layers were separated, washed with water, separated and the organic layer was dried. The crude product was crystallized from ethanol/water to obtain the pure intermediate.

Step 3): To a solution of the product of Step 2 (8.9 g, 14.9 mmol) in toluene (100 ml) at 50°C, was added N,O-bis(trimethylsilyl)acetamide (BSA) (7.50 ml, 30.3 mmol). After 0.5 h, solid TBAF (0.39 g, 1.5 mmol) was added and the reaction mixture stirred at 50°C for an additional 3 h. The reaction mixture was cooled to 22°C, CH<sub>3</sub>OH (10 ml), was added. The reaction mixture was washed with HCl (1N), NaHCO<sub>3</sub> (1N) and NaCl (sat'd.), and the organic layer was dried over MgSO<sub>4</sub>.

Step 4): To a solution of the product of Step 3 (0.94 g, 2.2 mmol) in CH<sub>3</sub>OH (3 ml), was added water (1 ml) and LiOH·H<sub>2</sub>O (102 mg, 2.4 mmole). The reaction mixture was stirred at 22°C for 1 h and then additional LiOH·H<sub>2</sub>O (54 mg, 1.3 mmole) was added. After a total of 2 h, HCl (1N) and EtOAc was added, the layers were separated, the organic layer was dried and concentrated in *vacuo*. To a solution of

- 42 -

the resultant product (0.91 g, 2.2 mmol) in  $\text{CH}_2\text{Cl}_2$  at  $22^\circ\text{C}$ , was added  $\text{ClCOCOCI}$  (0.29 ml, 3.3 mmol) and the mixture stirred for 16 h. The solvent was removed in *vacuo*.

Step 5): To an efficiently stirred suspension of 4-fluorophenylzinc chloride (4.4 mmol) prepared from 4-fluorophenylmagnesium bromide (1M in THF, 4.4 ml, 4.4 mmol) and  $\text{ZnCl}_2$  (0.6 g, 4.4 mmol) at  $4^\circ\text{C}$ , was added tetrakis(triphenylphosphine)palladium (0.25 g, 0.21 mmol) followed by the product of Step 4 (0.94 g, 2.2 mmol) as a solution in THF (2 ml). The reaction was stirred for 1 h at  $0^\circ\text{C}$  and then for 0.5 h at  $22^\circ\text{C}$ .  $\text{HCl}$  (1N, 5 ml) was added and the mixture was extracted with EtOAc. The organic layer was concentrated to an oil and purified by silica gel chromatography to obtain 1-(4-fluorophenyl)-4(S)-(4-hydroxyphenyl)-3(R)-(3-oxo-3-phenylpropyl)-2-azetidinone:

HRMS calc'd for  $\text{C}_{24}\text{H}_{19}\text{F}_2\text{NO}_3$  = 408.1429, found 408.1411.

Step 6): To the product of Step 5 (0.95 g, 1.91 mmol) in THF (3 ml), was added (R)-tetrahydro-1-methyl-3,3-diphenyl-1H,3H-pyrrolo-[1,2-c][1,3,2] oxazaborole (120 mg, 0.43 mmol) and the mixture was cooled to  $-20^\circ\text{C}$ . After 5 min, borohydride-dimethylsulfide complex (2M in THF, 0.85 ml, 1.7 mmol) was added dropwise over 0.5 h. After a total of 1.5 h,  $\text{CH}_3\text{OH}$  was added followed by  $\text{HCl}$  (1 N) and the reaction mixture was extracted with EtOAc to obtain 1-(4-fluorophenyl)-3(R)-[3(S)-(4-fluorophenyl)-3-hydroxypropyl]-4(S)-[4-(phenylmethoxy)phenyl]-2-azetidinone (compound 6A-1) as an oil.  $^1\text{H}$  in  $\text{CDCl}_3$  d H3 = 4.68. J = 2.3 Hz. CI ( $\text{M}^+\text{H}$ ) 500.

Use of (S)-tetra-hydro-1-methyl-3,3-diphenyl-1H,3H-pyrrolo-[1,2-c][1,3,2] oxazaborole gives the corresponding 3(R)-hydroxypropyl azetidinone (compound 6B-1).  $^1\text{H}$  in  $\text{CDCl}_3$  d H3 = 4.69. J = 2.3 Hz. CI ( $\text{M}^+\text{H}$ ) 500.

To a solution of compound 6A-1 (0.4 g, 0.8 mmol) in ethanol (2 ml), was added 10% Pd/C (0.03 g) and the reaction mixture was stirred under a pressure (60 psi) of  $\text{H}_2$  gas for 16 h. The reaction mixture was filtered and the solvent was concentrated to

obtain compound 6A. Mp  $164\text{--}166^\circ\text{C}$ ; CI ( $\text{M}^+\text{H}$ ) 410.  $[\alpha]_{\text{D}}^{25} = -28.1^\circ$  (c 3,  $\text{CH}_3\text{OH}$ ).

Elemental analysis calc'd for  $\text{C}_{24}\text{H}_{21}\text{F}_2\text{NO}_3$ : C 70.41; H 5.17; N 3.42; found C 70.25; H 5.19; N 3.54.

- 43 -

Similarly treat compound 6B-1 to obtain compound 6B.

Mp 129.5-132.5°C; CI (M<sup>+</sup>H) 410. Elemental analysis calc'd for C<sub>24</sub>H<sub>21</sub>F<sub>2</sub>NO<sub>3</sub>:  
C 70.41; H 5.17; N 3.42; found C 70.30; H 5.14; N 3.52.

Step 6' (Alternative): To a solution of the product of Step 5 (0.14 g, 0.3 mmol)  
in ethanol (2 ml), was added 10% Pd/C (0.03 g) and the reaction was stirred under a  
pressure (60 psi) of H<sub>2</sub> gas for 16 h. The reaction mixture was filtered and the solvent  
was concentrated to afford a 1:1 mixture of compounds 6A and 6B.

### Hypothetical In Vivo Evaluation

The compound of Formula II (or any cholesterol absorption inhibitor discussed  
above) is administered to rodents which have been induced to develop experimental  
autoimmune encephalomyelitis ("EAE"), a model of human multiple sclerosis and  
demyelinating disease. Useful rodents can include C57BL/6 mice (obtained from the  
Jackson Laboratory or Charles River Laboratories) immunized with myelin  
oligodendrocyte protein (MOG) 35-55 peptide, SJL/J (also available from Jackson  
Laboratory or Charles River Laboratories) mice immunized with proteolipid protein  
(PLP) peptides, or Lewis, BN or DA rats (obtained from Charles River Laboratories or  
Harlan Laboratories) immunized with guinea pig spinal cord homogenate or myelin  
basic protein (MBP). All immunizations are performed by emulsifying the inducing  
peptide in either incomplete Freund's adjuvant or complete Freund's adjuvant, with or  
without pertussis toxin administration (as described in *Current Protocols in  
Immunology*, Unit 15, John Wiley & Sons, Inc. NY, or Tran et al, *Eur. J. Immunol.*  
30:1410, 2002 or H. Butzkeuven et al, *Nat. Med.* 8:613, 2002).

Alternatively, the compound of Formula II (or any cholesterol absorption  
inhibitor discussed above) is administered to anti-MBP T cell receptor transgenic mice  
(as in Grewal et al *Immunity* 14:291, 2001), which naturally develop EAE disease.

Alternatively the compound of Formula II (or any cholesterol absorption inhibitor  
discussed above) is administered to rodents adoptively transferred with MBP-specific,  
PLP-specific or MOG-specific T cell lines (as described in *Current Protocols in  
Immunology*, Unit 15, John Wiley & Sons, Inc. NY).

Alternatively, the compound of Formula II (or any cholesterol absorption  
inhibitor discussed above) is administered to SJL/J or C57BL/6 mice which can be

- 44 -

induced to develop a profound demyelinating disease by intracerebral inoculation with Theiler's murine encephalomyelitis virus (as described in Pope et al, *J. Immunol.* 156:4050, 1994) or by intraperitoneal injection of Simliki Forest virus (as described in Soilu-Hanninen et al, *J. Virol.* 68:6291, 1994).

5           The compound is administered at a dosage of 0.1-50 mg/kg/day either in the diet or by systemic oral, subcutaneous or intraperitoneal administration over a period of 4-10 weeks. Animals are scored daily for clinical disease score as described in *Current Protocols in Immunology*, Unit 15, John Wiley & Sons, Inc. NY, or Tran et al, *Eur. J. Immunol.* 30:1410, 2002 or H. Butzkeuven et al, *Nat. Med.* 8:613, 2002). At a  
10       specified period of compound administration, animals are euthanized by CO<sub>2</sub> asphyxiation and histological, immunohistochemical and immunological parameters measured as in Tran et al, *Eur. J. Immunol.* 30:1410, 2002 or H. Butzkeuven et al, *Nat. Med.* 8:613, 2002. Serum lipoprotein and cholesterol measurements will be made by standard techniques well known to those skilled in the art.

15           It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications that are within the  
20       spirit and scope of the invention, as defined by the appended claims.

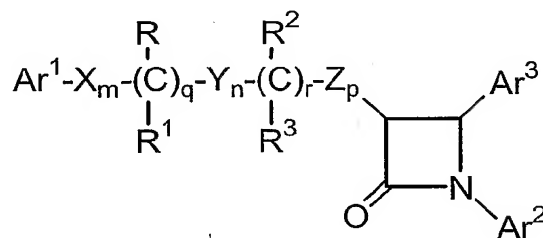
- 45 -

THEREFORE, WE CLAIM:

1. A method of treating or preventing demyelination in a subject, comprising the step of administering to a subject in need of such treatment an effective amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof.

2. The method according to claim 1, wherein the at least one sterol absorption inhibitor is selected from the group consisting of compounds represented by:

(a) Formula (I):



(I)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein in Formula (I):

Ar¹ and Ar² are independently selected from the group consisting of aryl and R⁴-substituted aryl;

Ar³ is aryl or R⁵-substituted aryl;

X, Y and Z are independently selected from the group consisting of -CH₂-, -CH(lower alkyl)- and -C(dilower alkyl)-;

R and R² are independently selected from the group consisting of -OR⁶, -O(CO)R⁶, -O(CO)OR⁹ and -O(CO)NR⁶R⁷;

R¹ and R³ are independently selected from the group consisting of hydrogen, lower alkyl and aryl;

q is 0 or 1;

r is 0 or 1;

- 46 -

m, n and p are independently selected from 0, 1, 2, 3 or 4; provided that at least one of q and r is 1, and the sum of m, n, p, q and r is 1, 2, 3, 4, 5 or 6; and provided that when p is 0 and r is 1, the sum of m, q and n is 1, 2, 3, 4 or 5;

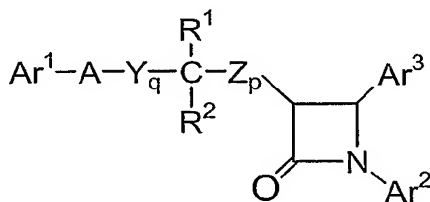
$R^4$  is 1-5 substituents independently selected from the group consisting of lower alkyl,  $-OR^6$ ,  $-O(CO)R^6$ ,  $-O(CO)OR^9$ ,  $-O(CH_2)_{1-5}OR^6$ ,  $-O(CO)NR^6R^7$ ,  $-NR^6R^7$ ,  $-NR^6(CO)R^7$ ,  $-NR^6(CO)OR^9$ ,  $-NR^6(CO)NR^7R^8$ ,  $-NR^6SO_2R^9$ ,  $-COOR^6$ ,  $-CONR^6R^7$ ,  $-COR^6$ ,  $-SO_2NR^6R^7$ ,  $S(O)_{0-2}R^9$ ,  $-O(CH_2)_{1-10}-COOR^6$ ,  $-O(CH_2)_{1-10}CONR^6R^7$ ,  $-(lower\ alkylene)COOR^6$ ,  $-CH=CH-COOR^6$ ,  $-CF_3$ ,  $-CN$ ,  $-NO_2$  and halogen;

$R^5$  is 1-5 substituents independently selected from the group consisting of  $-OR^6$ ,  $-O(CO)R^6$ ,  $-O(CO)OR^9$ ,  $-O(CH_2)_{1-5}OR^6$ ,  $-O(CO)NR^6R^7$ ,  $-NR^6R^7$ ,  $-NR^6(CO)R^7$ ,  $-NR^6(CO)OR^9$ ,  $-NR^6(CO)NR^7R^8$ ,  $-NR^6SO_2R^9$ ,  $-COOR^6$ ,  $-CONR^6R^7$ ,  $-COR^6$ ,  $-SO_2NR^6R^7$ ,  $S(O)_{0-2}R^9$ ,  $-O(CH_2)_{1-10}-COOR^6$ ,  $-O(CH_2)_{1-10}CONR^6R^7$ ,  $-(lower\ alkylene)COOR^6$  and  $-CH=CH-COOR^6$ ;

$R^6$ ,  $R^7$  and  $R^8$  are independently selected from the group consisting of hydrogen, lower alkyl, aryl and aryl-substituted lower alkyl; and

$R^9$  is lower alkyl, aryl or aryl-substituted lower alkyl;

(b) Formula (III):



(III)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (III) above:

$Ar^1$  is  $R^3$ -substituted aryl;

$Ar^2$  is  $R^4$ -substituted aryl;

$Ar^3$  is  $R^5$ -substituted aryl;

- 47 -

Y and Z are independently selected from the group consisting of  $-\text{CH}_2-$ ,  $-\text{CH}(\text{lower alkyl})-$  and  $-\text{C}(\text{dilower alkyl})-$ ;

A is selected from  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{S}(\text{O})-$  or  $-\text{S}(\text{O})_2-$ ;

$\text{R}^1$  is selected from the group consisting of  $-\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{R}^6$ ,  $-\text{O}(\text{CO})\text{OR}^9$  and  $-\text{O}(\text{CO})\text{NR}^6\text{R}^7$ ;  $\text{R}^2$  is selected from the group consisting of hydrogen, lower alkyl and aryl; or  $\text{R}^1$  and  $\text{R}^2$  together are  $=\text{O}$ ;

q is 1, 2 or 3;

p is 0, 1, 2, 3 or 4;

$\text{R}^5$  is 1-3 substituents independently selected from the group consisting of  $-\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{R}^6$ ,  $-\text{O}(\text{CO})\text{OR}^9$ ,  $-\text{O}(\text{CH}_2)_{1-5}\text{OR}^9$ ,  $-\text{O}(\text{CO})\text{NR}^6\text{R}^7$ ,  $-\text{NR}^6\text{R}^7$ ,  $-\text{NR}^6(\text{CO})\text{R}^7$ ,  $-\text{NR}^6(\text{CO})\text{OR}^9$ ,  $-\text{NR}^6(\text{CO})\text{NR}^7\text{R}^8$ ,  $-\text{NR}^6\text{SO}_2\text{-lower alkyl}$ ,  $-\text{NR}^6\text{SO}_2\text{-aryl}$ ,  $-\text{CONR}^6\text{R}^7$ ,  $-\text{COR}^6$ ,  $-\text{SO}_2\text{NR}^6\text{R}^7$ ,  $\text{S}(\text{O})_{0-2}\text{-alkyl}$ ,  $\text{S}(\text{O})_{0-2}\text{-aryl}$ ,  $-\text{O}(\text{CH}_2)_{1-10}\text{-COOR}^6$ ,  $-\text{O}(\text{CH}_2)_{1-10}\text{CONR}^6\text{R}^7$ , o-halogeno, m-halogeno, o-lower alkyl, m-lower alkyl,  $-(\text{lower alkylene})\text{-COOR}^6$ , and

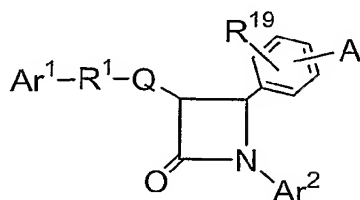
$-\text{CH}=\text{CH-COOR}^6$ ;

$\text{R}^3$  and  $\text{R}^4$  are independently 1-3 substituents independently selected from the group consisting of  $\text{R}^5$ , hydrogen, p-lower alkyl, aryl,  $-\text{NO}_2$ ,  $-\text{CF}_3$  and p-halogeno;

$\text{R}^6$ ,  $\text{R}^7$  and  $\text{R}^8$  are independently selected from the group consisting of hydrogen, lower alkyl, aryl and aryl-substituted lower alkyl; and

$\text{R}^9$  is lower alkyl, aryl or aryl-substituted lower alkyl;

(c) Formula (IV):



(IV)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (IV) above:



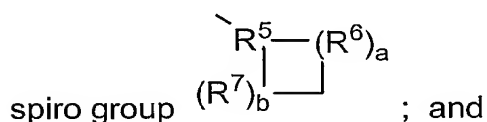
- 48 -

A is selected from the group consisting of  $R^2$ -substituted heterocycloalkyl,  $R^2$ -substituted heteroaryl,  $R^2$ -substituted benzofused heterocycloalkyl, and  $R^2$ -substituted benzofused heteroaryl;

$Ar^1$  is aryl or  $R^3$ -substituted aryl;

5  $Ar^2$  is aryl or  $R^4$ -substituted aryl;

Q is a bond or, with the 3-position ring carbon of the azetidinone, forms the



$R^1$  is selected from the group consisting of:

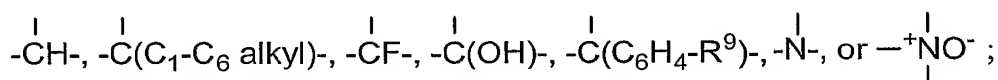
10  $-(CH_2)_q-$ , wherein q is 2-6, provided that when Q forms a spiro ring, q can also be zero or 1;

$-(CH_2)_e-G-(CH_2)_r-$ , wherein G is  $-O-$ ,  $-C(O)-$ , phenylene,  $-NR^8-$  or  $-S(O)_{0-2}-$ , e is 0-5 and r is 0-5, provided that the sum of e and r is 1-6;

$-(C_2-C_6 \text{ alkenylene})-$ ; and

15  $-(CH_2)_f-V-(CH_2)_g-$ , wherein V is  $C_3-C_6$  cycloalkylene, f is 1-5 and g is 0-5, provided that the sum of f and g is 1-6;

$R^5$  is selected from:



$R^6$  and  $R^7$  are independently selected from the group consisting of  $-CH_2-$ ,  $-CH(C_1-C_6 \text{ alkyl})-$ ,  $-C(\text{di-}(C_1-C_6) \text{ alkyl})-$ ,  $-CH=CH-$  and

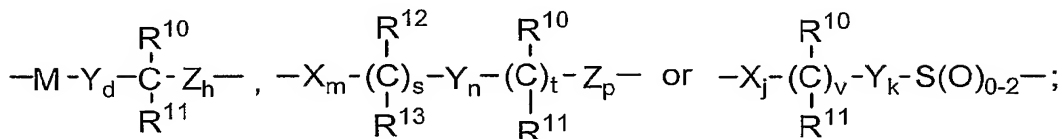
20  $-C(C_1-C_6 \text{ alkyl})=CH-$ ; or  $R^5$  together with an adjacent  $R^6$ , or  $R^5$  together with an adjacent  $R^7$ , form a  $-CH=CH-$  or a  $-CH=C(C_1-C_6 \text{ alkyl})-$  group;

a and b are independently 0, 1, 2 or 3, provided both are not zero; provided that when  $R^6$  is  $-CH=CH-$  or  $-C(C_1-C_6 \text{ alkyl})=CH-$ , a is 1; provided that when  $R^7$  is  $-CH=CH-$  or  $-C(C_1-C_6 \text{ alkyl})=CH-$ , b is 1; provided that when a is 2 or 3, the  $R^6$ 's can be the same or different; and provided that when b is 2 or 3, the  $R^7$ 's can be the same or different;

25

- 49 -

and when Q is a bond, R<sup>1</sup> also can be selected from:



where M is -O-, -S-, -S(O)- or -S(O)<sub>2</sub>-;

X, Y and Z are independently selected from the group consisting of  
 5 -CH<sub>2</sub>-, -CH(C<sub>1</sub>-C<sub>6</sub> alkyl)- and -C(di-(C<sub>1</sub>-C<sub>6</sub>) alkyl);

R<sup>10</sup> and R<sup>12</sup> are independently selected from the group consisting of  
 -OR<sup>14</sup>, -O(CO)R<sup>14</sup>, -O(CO)OR<sup>16</sup> and -O(CO)NR<sup>14</sup>R<sup>15</sup>;

R<sup>11</sup> and R<sup>13</sup> are independently selected from the group consisting of hydrogen,  
 (C<sub>1</sub>-C<sub>6</sub>)alkyl and aryl; or R<sup>10</sup> and R<sup>11</sup> together are =O, or R<sup>12</sup> and R<sup>13</sup> together are =O;

10 d is 1, 2 or 3;

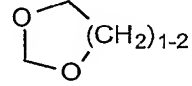
h is 0, 1, 2, 3 or 4;

s is 0 or 1; t is 0 or 1; m, n and p are independently 0-4; provided that at least  
 one of s and t is 1, and the sum of m, n, p, s and t is 1-6; provided that when p is 0  
 and t is 1, the sum of m, s and n is 1-5; and provided that when p is 0 and s is 1, the  
 15 sum of m, t and n is 1-5;

v is 0 or 1;

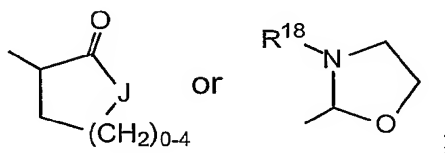
j and k are independently 1-5, provided that the sum of j, k and v is 1-5;

R<sup>2</sup> is 1-3 substituents on the ring carbon atoms selected from the group  
 consisting of hydrogen, (C<sub>1</sub>-C<sub>10</sub>)alkyl, (C<sub>2</sub>-C<sub>10</sub>)alkenyl, (C<sub>2</sub>-C<sub>10</sub>)alkynyl,  
 20 (C<sub>3</sub>-C<sub>6</sub>)cycloalkyl, (C<sub>3</sub>-C<sub>6</sub>)cycloalkenyl, R<sup>17</sup>-substituted aryl, R<sup>17</sup>-substituted benzyl,  
 R<sup>17</sup>-substituted benzyloxy, R<sup>17</sup>-substituted aryloxy, halogeno, -NR<sup>14</sup>R<sup>15</sup>,  
 NR<sup>14</sup>R<sup>15</sup>(C<sub>1</sub>-C<sub>6</sub> alkylene)-, NR<sup>14</sup>R<sup>15</sup>C(O)(C<sub>1</sub>-C<sub>6</sub> alkylene)-, -NHC(O)R<sup>16</sup>,  
 OH, C<sub>1</sub>-C<sub>6</sub> alkoxy, -OC(O)R<sup>16</sup>, -COR<sup>14</sup>, hydroxy(C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-  
 C<sub>6</sub>)alkyl, NO<sub>2</sub>, -S(O)<sub>0-2</sub>R<sup>16</sup>, -SO<sub>2</sub>NR<sup>14</sup>R<sup>15</sup> and -(C<sub>1</sub>-C<sub>6</sub> alkylene)COOR<sup>14</sup>; when R<sup>2</sup> is a

25 substituent on a heterocycloalkyl ring, R<sup>2</sup> is as defined, or is =O or ; and,  
 where R<sup>2</sup> is a substituent on a substitutable ring nitrogen, it is hydrogen,

- 50 -

(C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl, (C<sub>1</sub>-C<sub>6</sub>)alkoxy, aryloxy, (C<sub>1</sub>-C<sub>6</sub>)alkylcarbonyl, arylcarbonyl, hydroxy, -(CH<sub>2</sub>)<sub>1-6</sub>CONR<sup>18</sup>R<sup>18</sup>,



wherein J is -O-, -NH-, -NR<sup>18</sup>- or -CH<sub>2</sub>-;

5        R<sup>3</sup> and R<sup>4</sup> are independently selected from the group consisting of 1-3 substituents independently selected from the group consisting of (C<sub>1</sub>-C<sub>6</sub>)alkyl, -OR<sup>14</sup>, -O(CO)R<sup>14</sup>, -O(CO)OR<sup>16</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>14</sup>, -O(CO)NR<sup>14</sup>R<sup>15</sup>, -NR<sup>14</sup>R<sup>15</sup>, -NR<sup>14</sup>(CO)R<sup>15</sup>, -NR<sup>14</sup>(CO)OR<sup>16</sup>, -NR<sup>14</sup>(CO)NR<sup>15</sup>R<sup>19</sup>, -NR<sup>14</sup>SO<sub>2</sub>R<sup>16</sup>, -COOR<sup>14</sup>, -CONR<sup>14</sup>R<sup>15</sup>, -COR<sup>14</sup>, -SO<sub>2</sub>NR<sup>14</sup>R<sup>15</sup>, S(O)<sub>0-2</sub>R<sup>16</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>14</sup>,  
10      -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>14</sup>R<sup>15</sup>, -(C<sub>1</sub>-C<sub>6</sub> alkylene)-COOR<sup>14</sup>, -CH=CH-COOR<sup>14</sup>, -CF<sub>3</sub>, -CN, -NO<sub>2</sub> and halogen;

R<sup>8</sup> is hydrogen, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl (C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)R<sup>14</sup> or -COOR<sup>14</sup>;

R<sup>9</sup> and R<sup>17</sup> are independently 1-3 groups independently selected from the group consisting of hydrogen, (C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>6</sub>)alkoxy, -COOH, NO<sub>2</sub>,

15      -NR<sup>14</sup>R<sup>15</sup>, OH and halogeno;

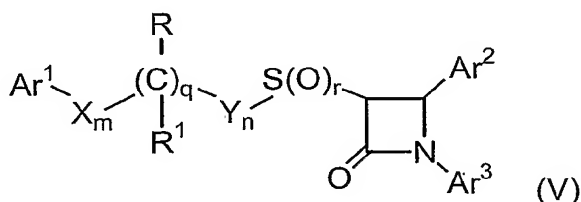
R<sup>14</sup> and R<sup>15</sup> are independently selected from the group consisting of hydrogen, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl and aryl-substituted (C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>16</sup> is (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl or R<sup>17</sup>-substituted aryl;

R<sup>18</sup> is hydrogen or (C<sub>1</sub>-C<sub>6</sub>)alkyl; and

20      R<sup>19</sup> is hydrogen, hydroxy or (C<sub>1</sub>-C<sub>6</sub>)alkoxy;

(d)    Formula (V):



or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (V) above:

$\text{Ar}^1$  is aryl,  $\text{R}^{10}$ -substituted aryl or heteroaryl;

$\text{Ar}^2$  is aryl or  $\text{R}^4$ -substituted aryl;

5  $\text{Ar}^3$  is aryl or  $\text{R}^5$ -substituted aryl;

X and Y are independently selected from the group consisting of  $-\text{CH}_2-$ ,  $-\text{CH}(\text{lower alkyl})-$  and  $-\text{C}(\text{dilower alkyl})-$ ;

R is  $-\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{R}^6$ ,  $-\text{O}(\text{CO})\text{OR}^9$  or  $-\text{O}(\text{CO})\text{NR}^6\text{R}^7$ ;  $\text{R}^1$  is hydrogen, lower alkyl or aryl; or R and  $\text{R}^1$  together are  $=\text{O}$ ;

10 q is 0 or 1;

r is 0, 1 or 2;

m and n are independently 0, 1, 2, 3, 4 or 5; provided that the sum of m, n and q is 1, 2, 3, 4 or 5;

$\text{R}^4$  is 1-5 substituents independently selected from the group consisting of  
15 lower alkyl,  $-\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{R}^6$ ,  $-\text{O}(\text{CO})\text{OR}^9$ ,  $-\text{O}(\text{CH}_2)_{1-5}\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{NR}^6\text{R}^7$ ,  
 $-\text{NR}^6\text{R}^7$ ,  $-\text{NR}^6(\text{CO})\text{R}^7$ ,  $-\text{NR}^6(\text{CO})\text{OR}^9$ ,  $-\text{NR}^6(\text{CO})\text{NR}^7\text{R}^8$ ,  $-\text{NR}^6\text{SO}_2\text{R}^9$ ,  $-\text{COOR}^6$ ,  
 $-\text{CONR}^6\text{R}^7$ ,  $-\text{COR}^6$ ,  $-\text{SO}_2\text{NR}^6\text{R}^7$ ,  $\text{S}(\text{O})_{0-2}\text{R}^9$ ,  $-\text{O}(\text{CH}_2)_{1-10}-\text{COOR}^6$ ,  
 $-\text{O}(\text{CH}_2)_{1-10}\text{CONR}^6\text{R}^7$ ,  $-(\text{lower alkylene})\text{COOR}^6$  and  $-\text{CH}=\text{CH}-\text{COOR}^6$ ;

$\text{R}^5$  is 1-5 substituents independently selected from the group consisting of  
20  $-\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{R}^6$ ,  $-\text{O}(\text{CO})\text{OR}^9$ ,  $-\text{O}(\text{CH}_2)_{1-5}\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{NR}^6\text{R}^7$ ,  $-\text{NR}^6\text{R}^7$ ,  $-\text{NR}^6(\text{CO})\text{R}^7$ ,  
 $-\text{NR}^6(\text{CO})\text{OR}^9$ ,  $-\text{NR}^6(\text{CO})\text{NR}^7\text{R}^8$ ,  $-\text{NR}^6\text{SO}_2\text{R}^9$ ,  $-\text{COOR}^6$ ,  $-\text{CONR}^6\text{R}^7$ ,  $-\text{COR}^6$ ,  
 $-\text{SO}_2\text{NR}^6\text{R}^7$ ,  $\text{S}(\text{O})_{0-2}\text{R}^9$ ,  $-\text{O}(\text{CH}_2)_{1-10}-\text{COOR}^6$ ,  $-\text{O}(\text{CH}_2)_{1-10}\text{CONR}^6\text{R}^7$ ,  $-\text{CF}_3$ ,  $-\text{CN}$ ,  $-\text{NO}_2$ ,  
halogen,

$-(\text{lower alkylene})\text{COOR}^6$  and  $-\text{CH}=\text{CH}-\text{COOR}^6$ ;

25  $\text{R}^6$ ,  $\text{R}^7$  and  $\text{R}^8$  are independently selected from the group consisting of hydrogen, lower alkyl, aryl and aryl-substituted lower alkyl;

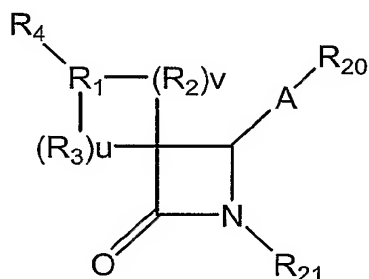
$\text{R}^9$  is lower alkyl, aryl or aryl-substituted lower alkyl; and

$\text{R}^{10}$  is 1-5 substituents independently selected from the group consisting of lower alkyl,  $-\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{R}^6$ ,  $-\text{O}(\text{CO})\text{OR}^9$ ,  $-\text{O}(\text{CH}_2)_{1-5}\text{OR}^6$ ,  $-\text{O}(\text{CO})\text{NR}^6\text{R}^7$ ,

- 52 -

-NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>(CO)R<sup>7</sup>, -NR<sup>6</sup>(CO)OR<sup>9</sup>, -NR<sup>6</sup>(CO)NR<sup>7</sup>R<sup>8</sup>, -NR<sup>6</sup>SO<sub>2</sub>R<sup>9</sup>, -COOR<sup>6</sup>,  
 -CONR<sup>6</sup>R<sup>7</sup>, -COR<sup>6</sup>, -SO<sub>2</sub>NR<sup>6</sup>R<sup>7</sup>, -S(O)<sub>0-2</sub>R<sup>9</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>6</sup>,  
 -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>6</sup>R<sup>7</sup>, -CF<sub>3</sub>, -CN, -NO<sub>2</sub> and halogen;

5 (e) Formula (VI):



(VI)

or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein in Formula (VI):

10 R<sub>1</sub> is

-CH-, -C(lower alkyl)-, -CF-, -C(OH)-, -C(C<sub>6</sub>H<sub>5</sub>)-, -C(C<sub>6</sub>H<sub>4</sub>-R<sub>15</sub>)-,  
 -N- or  $\text{--}\overset{+}{\text{N}}\text{O}^-$  ;

R<sub>2</sub> and R<sub>3</sub> are independently selected from the group consisting of:

-CH<sub>2</sub>-, -CH(lower alkyl)-, -C(di-lower alkyl)-, -CH=CH- and -C(lower alkyl)=CH-; or

15 R<sub>1</sub> together with an adjacent R<sub>2</sub>, or R<sub>1</sub> together with an adjacent R<sub>3</sub>, form a  
 -CH=CH- or a -CH=C(lower alkyl)- group;

u and v are independently 0, 1, 2 or 3, provided both are not zero; provided that  
 when R<sub>2</sub> is -CH=CH- or -C(lower alkyl)=CH-, v is 1; provided that when R<sub>3</sub> is  
 -CH=CH- or -C(lower alkyl)=CH-, u is 1; provided that when v is 2 or 3, the R<sub>2</sub>'s can  
 20 be the same or different; and provided that when u is 2 or 3, the R<sub>3</sub>'s can be the  
 same or different;

R<sub>4</sub> is selected from B-(CH<sub>2</sub>)<sub>m</sub>C(O)-, wherein m is 0, 1, 2, 3, 4 or 5;  
 B-(CH<sub>2</sub>)<sub>q</sub>-, wherein q is 0, 1, 2, 3, 4, 5 or 6;

- 53 -

B-(CH<sub>2</sub>)<sub>e</sub>-Z-(CH<sub>2</sub>)<sub>r</sub>-, wherein Z is -O-, -C(O)-, phenylene, -N(R<sub>8</sub>)- or -S(O)<sub>0-2</sub>-, e is 0, 1, 2, 3, 4 or 5 and r is 0, 1, 2, 3, 4 or 5, provided that the sum of e and r is 0, 1, 2, 3, 4, 5 or 6;

B-(C<sub>2</sub>-C<sub>6</sub> alkenylene)-;

5 B-(C<sub>4</sub>-C<sub>6</sub> alkadienylene)-;

B-(CH<sub>2</sub>)<sub>t</sub>-Z-(C<sub>2</sub>-C<sub>6</sub> alkenylene)-, wherein Z is as defined above, and wherein t is 0, 1, 2 or 3, provided that the sum of t and the number of carbon atoms in the alkenylene chain is 2, 3, 4, 5 or 6;

10 B-(CH<sub>2</sub>)<sub>f</sub>-V-(CH<sub>2</sub>)<sub>g</sub>-, wherein V is C<sub>3</sub>-C<sub>6</sub> cycloalkylene, f is 1, 2, 3, 4 or 5 and g is 0, 1, 2, 3, 4 or 5, provided that the sum of f and g is 1, 2, 3, 4, 5 or 6;

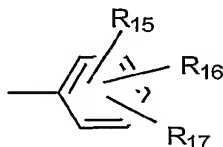
B-(CH<sub>2</sub>)<sub>t</sub>-V-(C<sub>2</sub>-C<sub>6</sub> alkenylene)- or

B-(C<sub>2</sub>-C<sub>6</sub> alkenylene)-V-(CH<sub>2</sub>)<sub>t</sub>-, wherein V and t are as defined above, provided that the sum of t and the number of carbon atoms in the alkenylene chain is 2, 3, 4, 5 or 6;

15 B-(CH<sub>2</sub>)<sub>a</sub>-Z-(CH<sub>2</sub>)<sub>b</sub>-V-(CH<sub>2</sub>)<sub>d</sub>-, wherein Z and V are as defined above and a, b and d are independently 0, 1, 2, 3, 4, 5 or 6, provided that the sum of a, b and d is 0, 1, 2, 3, 4, 5 or 6; or T-(CH<sub>2</sub>)<sub>s</sub>-, wherein T is cycloalkyl of 3-6 carbon atoms and s is 0, 1, 2, 3, 4, 5 or 6; or

R<sub>1</sub> and R<sub>4</sub> together form the group  $\text{B}-\text{CH}=\overset{\text{I}}{\text{C}}-$  ;

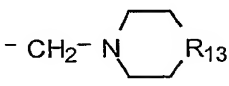
20 B is selected from indanyl, indenyl, naphthyl, tetrahydronaphthyl, heteroaryl or W-substituted heteroaryl, wherein heteroaryl is selected from the group consisting of pyrrolyl, pyridinyl, pyrimidinyl, pyrazinyl, triazinyl, imidazolyl, thiazolyl, pyrazolyl, thienyl, oxazolyl and furanyl, and for nitrogen-containing heteroaryls, the N-oxides thereof, or



25 W is 1 to 3 substituents independently selected from the group consisting of lower alkyl, hydroxy lower alkyl, lower alkoxy, alkoxyalkyl, alkoxyalkoxy, alkoxycarbonylalkoxy, (lower alkoxyimino)-lower alkyl, lower alkanedioyl, lower alkyl lower alkanedioyl, allyloxy, -CF<sub>3</sub>, -OCF<sub>3</sub>, benzyl, R<sub>7</sub>-benzyl, benzyloxy,

- 54 -

R7-benzyloxy, phenoxy, R7-phenoxy, dioxolanyl, NO<sub>2</sub>-, N(R<sub>8</sub>)(R<sub>9</sub>), N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylene-, N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylenyloxy-, OH, halogeno, -CN, -N<sub>3</sub>, -NHC(O)OR<sub>10</sub>, -NHC(O)R<sub>10</sub>, R<sub>11</sub>O<sub>2</sub>SNH-, (R<sub>11</sub>O<sub>2</sub>S)<sub>2</sub>N-, -S(O)<sub>2</sub>NH<sub>2</sub>, -S(O)<sub>0-2</sub>R<sub>8</sub>, tert-butyltrimethyl-silyloxymethyl, -C(O)R<sub>12</sub>, -COOR<sub>19</sub>, -CON(R<sub>8</sub>)(R<sub>9</sub>), -CH=CHC(O)R<sub>12</sub>,  
 5 -lower alkylene-C(O)R<sub>12</sub>, R<sub>10</sub>C(O)(lower alkylenyloxy)-, N(R<sub>8</sub>)(R<sub>9</sub>)C(O)(lower

alkylenyloxy)- and  for substitution on ring carbon atoms, and the substituents on the substituted heteroaryl ring nitrogen atoms, when present, are selected from the group consisting of lower alkyl, lower alkoxy, -C(O)OR<sub>10</sub>, -C(O)R<sub>10</sub>, OH, N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylene-, N(R<sub>8</sub>)(R<sub>9</sub>)-lower alkylenyloxy-, -S(O)<sub>2</sub>NH<sub>2</sub> and 2-(trimethylsilyl)-ethoxymethyl;  
 10

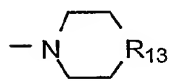
R<sub>7</sub> is 1-3 groups independently selected from the group consisting of lower alkyl, lower alkoxy, -COOH, NO<sub>2</sub>, -N(R<sub>8</sub>)(R<sub>9</sub>), OH, and halogeno;

R<sub>8</sub> and R<sub>9</sub> are independently selected from H or lower alkyl;

R<sub>10</sub> is selected from lower alkyl, phenyl, R<sub>7</sub>-phenyl, benzyl or R<sub>7</sub>-benzyl;

15 R<sub>11</sub> is selected from OH, lower alkyl, phenyl, benzyl, R<sub>7</sub>-phenyl or R<sub>7</sub>-benzyl;

R<sub>12</sub> is selected from H, OH, alkoxy, phenoxy, benzyloxy,

, -N(R<sub>8</sub>)(R<sub>9</sub>), lower alkyl, phenyl or R<sub>7</sub>-phenyl;

R<sub>13</sub> is selected from -O-, -CH<sub>2</sub>-, -NH-, -N(lower alkyl)- or -NC(O)R<sub>19</sub>;

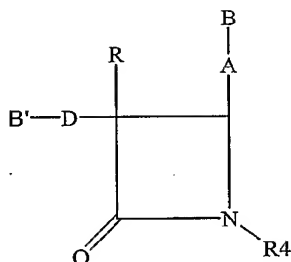
R<sub>15</sub>, R<sub>16</sub> and R<sub>17</sub> are independently selected from the group consisting of H and the groups defined for W; or R<sub>15</sub> is hydrogen and R<sub>16</sub> and R<sub>17</sub>, together with  
 20 adjacent carbon atoms to which they are attached, form a dioxolanyl ring;

R<sub>19</sub> is H, lower alkyl, phenyl or phenyl lower alkyl; and

R<sub>20</sub> and R<sub>21</sub> are independently selected from the group consisting of phenyl, W-substituted phenyl, naphthyl, W-substituted naphthyl, indanyl, indenyl, tetrahydronaphthyl, benzodioxolyl, heteroaryl, W-substituted heteroaryl, benzofused  
 25 heteroaryl, W-substituted benzofused heteroaryl and cyclopropyl, wherein heteroaryl is as defined above;

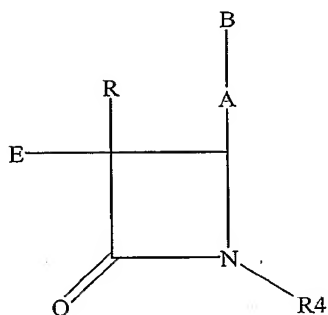
- 55 -

(f) Formula (VIIA) or (VIIB):



(VIIA)

or

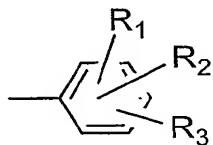


(VIIB)

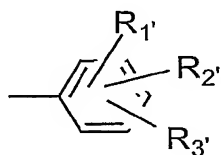
or a pharmaceutically acceptable salt or solvate thereof, wherein in Formulae (VIIA) or (VIIB):

A is  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$  or  $-(\text{CH}_2)_p-$  wherein p is 0, 1 or 2;

B is



B' is



D is  $-(\text{CH}_2)_m\text{C}(\text{O})-$  or  $-(\text{CH}_2)_q-$  wherein m is 1, 2, 3 or 4 and q is 2, 3 or 4;

E is  $\text{C}_{10}$  to  $\text{C}_{20}$  alkyl or  $-\text{C}(\text{O})-(\text{C}_9 \text{ to } \text{C}_{19})\text{-alkyl}$ , wherein the alkyl is straight or branched, saturated or containing one or more double bonds;

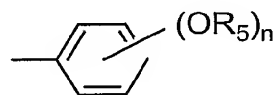


- 56 -

R is hydrogen, C<sub>1</sub>-C<sub>15</sub> alkyl, straight or branched, saturated or containing one or more double bonds, or B-(CH<sub>2</sub>)<sub>r</sub>-, wherein r is 0, 1, 2, or 3;

R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>1'</sub>, R<sub>2'</sub>, and R<sub>3'</sub> are independently selected from the group consisting of hydrogen, lower alkyl, lower alkoxy, carboxy, NO<sub>2</sub>, NH<sub>2</sub>, OH, halogeno,  
 5 lower alkylamino, dilower alkylamino, -NHC(O)OR<sub>5</sub>, R<sub>6</sub>O<sub>2</sub>SNH- and -S(O)<sub>2</sub>NH<sub>2</sub>;

R<sub>4</sub> is

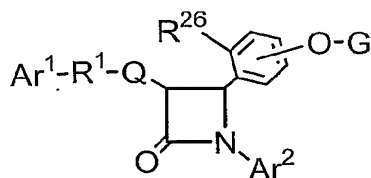


wherein n is 0, 1, 2 or 3;

R<sub>5</sub> is lower alkyl; and

10 R<sub>6</sub> is OH, lower alkyl, phenyl, benzyl or substituted phenyl wherein the substituents are 1-3 groups independently selected from the group consisting of lower alkyl, lower alkoxy, carboxy, NO<sub>2</sub>, NH<sub>2</sub>, OH, halogeno, lower alkylamino and dilower alkylamino;

15 (g) Formula (VIII):

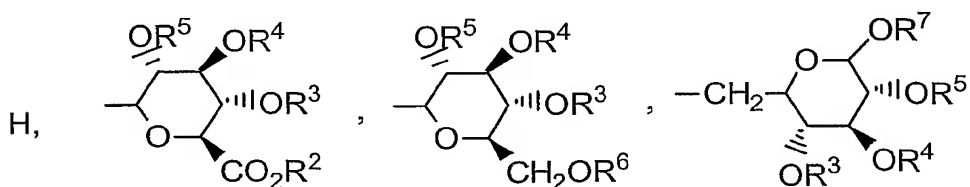


(VIII)

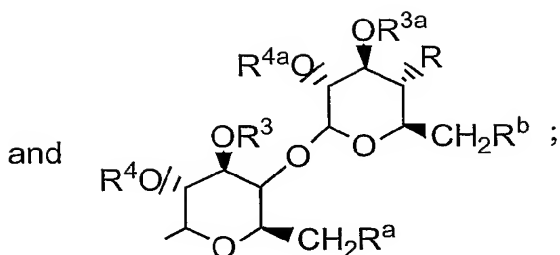
or a pharmaceutically acceptable salt thereof or a solvate thereof, wherein, in Formula (VIII) above,

20 R<sup>26</sup> is H or OG<sup>1</sup>;

G and G<sup>1</sup> are independently selected from the group consisting of



- 57 -

provided that when R<sup>26</sup> is H or

OH, G is not H;

R, R<sup>a</sup> and R<sup>b</sup> are independently selected from the group consisting of H, -OH, halogeno, -NH<sub>2</sub>, azido, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)-alkoxy or -W-R<sup>30</sup>;

W is independently selected from the group consisting of -NH-C(O)-, -O-C(O)-, -O-C(O)-N(R<sup>31</sup>)-, -NH-C(O)-N(R<sup>31</sup>)- and -O-C(S)-N(R<sup>31</sup>)-;

R<sup>2</sup> and R<sup>6</sup> are independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl and aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>7</sup>, R<sup>3a</sup> and R<sup>4a</sup> are independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)(C<sub>1</sub>-C<sub>6</sub>)alkyl and -C(O)aryl;

R<sup>30</sup> is selected from the group consisting of R<sup>32</sup>-substituted T, R<sup>32</sup>-substituted-T-(C<sub>1</sub>-C<sub>6</sub>)alkyl, R<sup>32</sup>-substituted-(C<sub>2</sub>-C<sub>4</sub>)alkenyl, R<sup>32</sup>-substituted-(C<sub>1</sub>-C<sub>6</sub>)alkyl, R<sup>32</sup>-substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl and R<sup>32</sup>-substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>31</sup> is selected from the group consisting of H and (C<sub>1</sub>-C<sub>4</sub>)alkyl;

T is selected from the group consisting of phenyl, furyl, thienyl, pyrrolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, benzothiazolyl, thiadiazolyl, pyrazolyl, imidazolyl and pyridyl;

R<sup>32</sup> is independently selected from 1-3 substituents independently selected from the group consisting of halogeno, (C<sub>1</sub>-C<sub>4</sub>)alkyl, -OH, phenoxy, -CF<sub>3</sub>, -NO<sub>2</sub>, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, methylenedioxy, oxo, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, -N(CH<sub>3</sub>)<sub>2</sub>, -C(O)-NH(C<sub>1</sub>-C<sub>4</sub>)alkyl, -C(O)-N((C<sub>1</sub>-C<sub>4</sub>)alkyl)<sub>2</sub>, -C(O)-(C<sub>1</sub>-C<sub>4</sub>)alkyl, -C(O)-(C<sub>1</sub>-C<sub>4</sub>)alkoxy and pyrrolidinylcarbonyl; or R<sup>32</sup> is a covalent bond and R<sup>31</sup>, the nitrogen to which it is

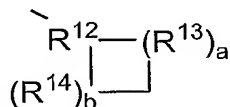
- 58 -

attached and R<sup>32</sup> form a pyrrolidinyl, piperidinyl, N-methyl-piperazinyl, indolinyl or morpholinyl group, or a (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl-substituted pyrrolidinyl, piperidinyl, N-methylpiperazinyl, indolinyl or morpholinyl group;

Ar<sup>1</sup> is aryl or R<sup>10</sup>-substituted aryl;

Ar<sup>2</sup> is aryl or R<sup>11</sup>-substituted aryl;

Q is a bond or, with the 3-position ring carbon of the azetidinone,

forms the spiro group ; and

R<sup>1</sup> is selected from the group consisting of

-(CH<sub>2</sub>)<sub>q</sub>-, wherein q is 2-6, provided that when Q forms a spiro ring, q

can also be zero or 1;

-(CH<sub>2</sub>)<sub>e</sub>-E-(CH<sub>2</sub>)<sub>r</sub>-, wherein E is -O-, -C(O)-, phenylene, -NR<sup>22</sup>- or

-S(O)<sub>0-2</sub>-, e is 0-5 and r is 0-5, provided that the sum of e and r is 1-6;

-(C<sub>2</sub>-C<sub>6</sub>)alkenylene-; and

-(CH<sub>2</sub>)<sub>f</sub>-V-(CH<sub>2</sub>)<sub>g</sub>-, wherein V is C<sub>3</sub>-C<sub>6</sub> cycloalkylene, f is 1-5 and g is 0-

5, provided that the sum of f and g is 1-6;

R<sup>12</sup> is

$\begin{array}{c} | \\ -\text{CH}- \\ | \end{array}$ ,  $\begin{array}{c} | \\ -\text{C}(\text{C}_1\text{-C}_6 \text{ alkyl})- \\ | \end{array}$ ,  $\begin{array}{c} | \\ -\text{CF}- \\ | \end{array}$ ,  $\begin{array}{c} | \\ -\text{C}(\text{OH})- \\ | \end{array}$ ,  $\begin{array}{c} | \\ -\text{C}(\text{C}_6\text{H}_4\text{-R}^{23})- \\ | \end{array}$ ,  $\begin{array}{c} | \\ -\text{N}- \\ | \end{array}$ , or  $\begin{array}{c} | \\ -\text{NO}^- \\ | \end{array}$ ;

R<sup>13</sup> and R<sup>14</sup> are independently selected from the group consisting of -CH<sub>2</sub>-,

-CH(C<sub>1</sub>-C<sub>6</sub> alkyl)-, -C(di-(C<sub>1</sub>-C<sub>6</sub>) alkyl)-, -CH=CH- and

-C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-; or R<sup>12</sup> together with an adjacent R<sup>13</sup>, or R<sup>12</sup> together with an adjacent R<sup>14</sup>, form a -CH=CH- or a -CH=C(C<sub>1</sub>-C<sub>6</sub> alkyl)- group;

a and b are independently 0, 1, 2 or 3, provided both are not zero;

provided that when R<sup>13</sup> is -CH=CH- or -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-, a is 1;

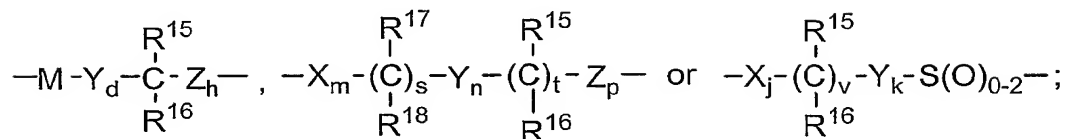
provided that when R<sup>14</sup> is -CH=CH- or -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-, b is 1;

provided that when a is 2 or 3, the R<sup>13</sup>'s can be the same or different; and

provided that when b is 2 or 3, the R<sup>14</sup>'s can be the same or different;

- 59 -

and when Q is a bond, R<sup>1</sup> also can be:



M is -O-, -S-, -S(O)- or -S(O)<sub>2</sub>-;

X, Y and Z are independently selected from the group consisting of -CH<sub>2</sub>-,  
 5 -CH(C<sub>1</sub>-C<sub>6</sub>)alkyl- and -C(di-(C<sub>1</sub>-C<sub>6</sub>)alkyl);

R<sup>10</sup> and R<sup>11</sup> are independently selected from the group consisting of 1-3  
 substituents independently selected from the group consisting of  
 (C<sub>1</sub>-C<sub>6</sub>)alkyl, -OR<sup>19</sup>, -O(CO)R<sup>19</sup>, -O(CO)OR<sup>21</sup>, -O(CH<sub>2</sub>)<sub>1-5</sub>OR<sup>19</sup>,  
 -O(CO)NR<sup>19</sup>R<sup>20</sup>, -NR<sup>19</sup>R<sup>20</sup>, -NR<sup>19</sup>(CO)R<sup>20</sup>, -NR<sup>19</sup>(CO)OR<sup>21</sup>,  
 10 -NR<sup>19</sup>(CO)NR<sup>20</sup>R<sup>25</sup>, -NR<sup>19</sup>SO<sub>2</sub>R<sup>21</sup>, -COOR<sup>19</sup>, -CONR<sup>19</sup>R<sup>20</sup>, -COR<sup>19</sup>,  
 -SO<sub>2</sub>NR<sup>19</sup>R<sup>20</sup>, S(O)<sub>0-2</sub>R<sup>21</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>-COOR<sup>19</sup>, -O(CH<sub>2</sub>)<sub>1-10</sub>CONR<sup>19</sup>R<sup>20</sup>,  
 -(C<sub>1</sub>-C<sub>6</sub> alkylene)-COOR<sup>19</sup>, -CH=CH-COOR<sup>19</sup>, -CF<sub>3</sub>, -CN, -NO<sub>2</sub> and halogen;

R<sup>15</sup> and R<sup>17</sup> are independently selected from the group consisting of -OR<sup>19</sup>,  
 -O(CO)R<sup>19</sup>, -O(CO)OR<sup>21</sup> and -O(CO)NR<sup>19</sup>R<sup>20</sup>;

15 R<sup>16</sup> and R<sup>18</sup> are independently selected from the group consisting of H,  
 (C<sub>1</sub>-C<sub>6</sub>)alkyl and aryl; or R<sup>15</sup> and R<sup>16</sup> together are =O, or R<sup>17</sup> and R<sup>18</sup> together are  
 =O;

d is 1, 2 or 3;

h is 0, 1, 2, 3 or 4;

20 s is 0 or 1; t is 0 or 1; m, n and p are independently 0-4;

provided that at least one of s and t is 1, and the sum of m, n, p, s and t is 1-6;

provided that when p is 0 and t is 1, the sum of m, s and n is 1-5; and provided  
 that when p is 0 and s is 1, the sum of m, t and n is 1-5;

v is 0 or 1;

25 j and k are independently 1-5, provided that the sum of j, k and v is 1-5;

- 60 -

and when Q is a bond and R<sup>1</sup> is 
$$\begin{array}{c} \text{R}^{15} \\ | \\ -\text{X}_j-(\text{C})_v-\text{Y}_k-\text{S}(\text{O})_{0-2}- \\ | \\ \text{R}^{16} \end{array}$$
, Ar<sup>1</sup> can also be pyridyl, isoxazolyl, furanyl, pyrrolyl, thienyl, imidazolyl, pyrazolyl, thiazolyl, pyrazinyl, pyrimidinyl or pyridazinyl;

R<sup>19</sup> and R<sup>20</sup> are independently selected from the group consisting of H,  
5 (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl and aryl-substituted (C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>21</sup> is (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl or R<sup>24</sup>-substituted aryl;

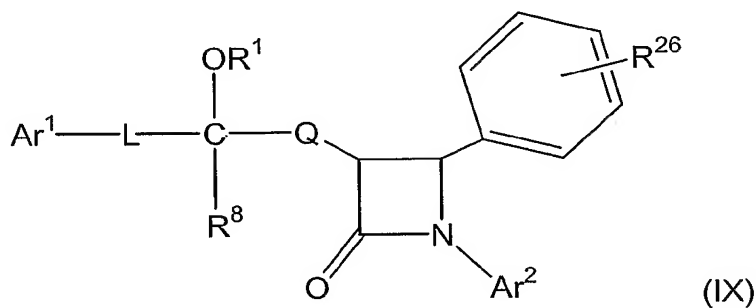
R<sup>22</sup> is H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl (C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)R<sup>19</sup> or -COOR<sup>19</sup>;

R<sup>23</sup> and R<sup>24</sup> are independently 1-3 groups independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>6</sub>)alkoxy, -COOH, NO<sub>2</sub>,

10 -NR<sup>19</sup>R<sup>20</sup>, -OH and halogeno; and

R<sup>25</sup> is H, -OH or (C<sub>1</sub>-C<sub>6</sub>)alkoxy; and

(h) Formula (IX):

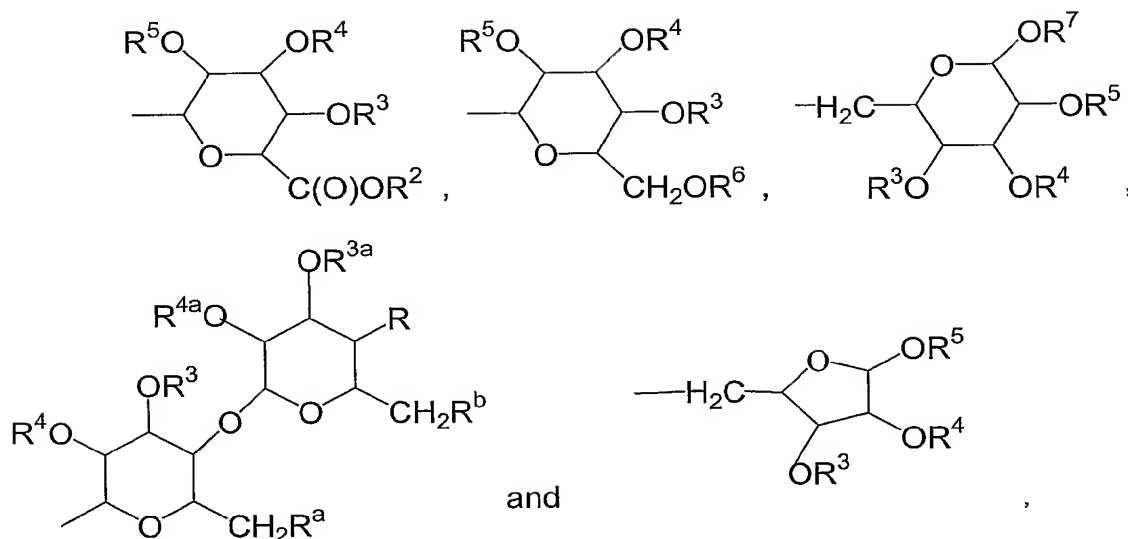


15 or a pharmaceutically acceptable salt or solvate thereof, wherein in Formula (IX):

R<sup>1</sup> is selected from the group consisting of H, G, G<sup>1</sup>, G<sup>2</sup>, -SO<sub>3</sub>H and -PO<sub>3</sub>H;

20 G is selected from the group consisting of: H,

- 61 -



wherein R,  $R^a$  and  $R^b$  are each independently selected from the group consisting of H, -OH, halo, -NH<sub>2</sub>, azido, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)alkoxy or -W- $R^{30}$ ;

W is independently selected from the group consisting of -NH-C(O)-, -O-C(O)-, -O-C(O)-N( $R^{31}$ )-, -NH-C(O)-N( $R^{31}$ )- and -O-C(S)-N( $R^{31}$ )-;

$R^2$  and  $R^6$  are each independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, acetyl, aryl and aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

$R^3$ ,  $R^4$ ,  $R^5$ ,  $R^7$ ,  $R^{3a}$  and  $R^{4a}$  are each independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, acetyl, aryl(C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)(C<sub>1</sub>-C<sub>6</sub>)alkyl and -C(O)aryl;

$R^{30}$  is independently selected from the group consisting of  $R^{32}$ -substituted T,  $R^{32}$ -substituted-T-(C<sub>1</sub>-C<sub>6</sub>)alkyl,  $R^{32}$ -substituted-(C<sub>2</sub>-C<sub>4</sub>)alkenyl,  $R^{32}$ -substituted-(C<sub>1</sub>-C<sub>6</sub>)alkyl,  $R^{32}$ -substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl and  $R^{32}$ -substituted-(C<sub>3</sub>-C<sub>7</sub>)cycloalkyl(C<sub>1</sub>-C<sub>6</sub>)alkyl;

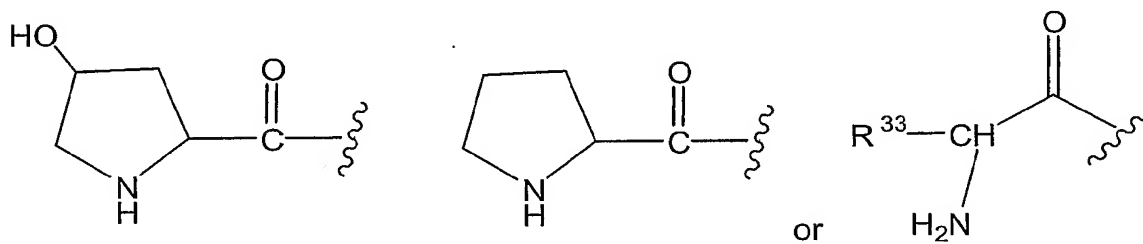
- 62 -

$R^{31}$  is independently selected from the group consisting of H and (C<sub>1</sub>-C<sub>4</sub>)alkyl;

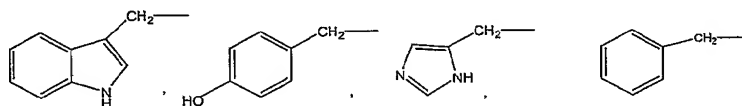
T is independently selected from the group consisting of phenyl, furyl, thienyl, pyrrolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, benzothiazolyl, thiadiazolyl, pyrazolyl, imidazolyl and pyridyl;

$R^{32}$  is independently selected from 1-3 substituents which are each independently selected from the group consisting of H, halo, (C<sub>1</sub>-C<sub>4</sub>)alkyl, -OH, phenoxy, -CF<sub>3</sub>, -NO<sub>2</sub>, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, methylenedioxy, oxo, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, -N(CH<sub>3</sub>)<sub>2</sub>, -C(O)-NH(C<sub>1</sub>-C<sub>4</sub>)alkyl, -C(O)-N((C<sub>1</sub>-C<sub>4</sub>)alkyl)<sub>2</sub>, -C(O)-(C<sub>1</sub>-C<sub>4</sub>)alkyl, -C(O)-(C<sub>1</sub>-C<sub>4</sub>)alkoxy and pyrrolidinylcarbonyl; or  $R^{32}$  is a covalent bond and  $R^{31}$ , the nitrogen to which it is attached and  $R^{32}$  form a pyrrolidinyl, piperidinyl, N-methyl-piperazinyl, indolyl or morpholyl group, or a (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl-substituted pyrrolidinyl, piperidinyl, N-methylpiperazinyl, indolyl or morpholyl group;

$G^1$  is represented by the structure:



wherein  $R^{33}$  is independently selected from the group consisting of unsubstituted alkyl,  $R^{34}$ -substituted alkyl,  $(R^{35})(R^{36})$ alkyl-,



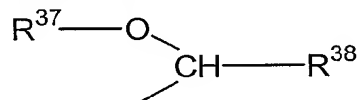
$R^{34}$  is one to three substituents, each  $R^{34}$  being independently selected from the group consisting of HOOC-, HO-, HS-, (CH<sub>3</sub>)S-, H<sub>2</sub>N-, (NH<sub>2</sub>)(NH)C(NH)-, (NH<sub>2</sub>)C(O)- and HOOCCH(NH<sub>3</sub><sup>+</sup>)CH<sub>2</sub>SS-;

- 63 -

$R^{35}$  is independently selected from the group consisting of H and  $NH_2$ ;

$R^{36}$  is independently selected from the group consisting of H, unsubstituted alkyl,  $R^{34}$ -substituted alkyl, unsubstituted cycloalkyl and  $R^{34}$ -substituted cycloalkyl;

5  $G^2$  is represented by the structure:



wherein  $R^{37}$  and  $R^{38}$  are each independently selected from the group consisting of ( $C_1$ - $C_6$ )alkyl and aryl;

10

$R^{26}$  is one to five substituents, each  $R^{26}$  being independently selected from the group consisting of:

- a) H;
- b) -OH;
- 15 c) -OCH<sub>3</sub>;
- d) fluorine;
- e) chlorine;
- f) -O-G;
- g) -O- $G^1$ ;
- 20 h) -O- $G^2$ ;
- i) -SO<sub>3</sub>H; and
- j) -PO<sub>3</sub>H;

provided that when  $R^1$  is H,  $R^{26}$  is not H, -OH, -OCH<sub>3</sub> or -O-G;

25

$Ar^1$  is aryl,  $R^{10}$ -substituted aryl, heteroaryl or  $R^{10}$ -substituted heteroaryl;

$Ar^2$  is aryl,  $R^{11}$ -substituted aryl, heteroaryl or  $R^{11}$ -substituted heteroaryl;

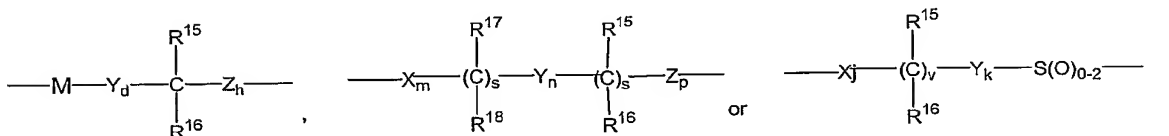
30

L is selected from the group consisting of:



- 64 -

- a) a covalent bond;  
 b)  $-(CH_2)_q-$ , wherein q is 1-6;  
 c)  $-(CH_2)_e-E-(CH_2)_r-$ , wherein E is  $-O-$ ,  $-C(O)-$ , phenylene,  $-NR^{22}-$  or  $-S(O)_{0-2}-$ , e is 0-5 and r is 0-5, provided that the sum of e and r is 1-6;  
 5 d)  $-(C_2-C_6)alkenylene-$ ;  
 e)  $-(CH_2)_f-V-(CH_2)_g-$ , wherein V is  $C_3-C_6$ cycloalkylene, f is 1-5 and g is 0-5, provided that the sum of f and g is 1-6; and  
 f)



wherein M is  $-O-$ ,  $-S-$ ,  $-S(O)-$  or  $-S(O)_2-$ ;

X, Y and Z are each independently selected from the group consisting of  $-CH_2-$ ,  $-CH(C_1-C_6)alkyl-$  and  $-C(di-(C_1-C_6)alkyl)-$ ;

$R^8$  is selected from the group consisting of H and alkyl;

$R^{10}$  and  $R^{11}$  are each independently selected from the group consisting of 1-3 substituents which are each independently selected from the group consisting of  $(C_1-C_6)alkyl$ ,  $-OR^{19}$ ,  $-O(CO)R^{19}$ ,  $-O(CO)OR^{21}$ ,  $-O(CH_2)_{1-5}OR^{19}$ ,  $-O(CO)NR^{19}R^{20}$ ,  $-NR^{19}R^{20}$ ,  $-NR^{19}(CO)R^{20}$ ,  $-NR^{19}(CO)OR^{21}$ ,  $-NR^{19}(CO)NR^{20}R^{25}$ ,  $-NR^{19}SO_2R^{21}$ ,  $-COOR^{19}$ ,  $-CONR^{19}R^{20}$ ,  $-COR^{19}$ ,  $-SO_2NR^{19}R^{20}$ ,  $S(O)_{0-2}R^{21}$ ,  $-O(CH_2)_{1-10}COOR^{19}$ ,  $-O(CH_2)_{1-10}CONR^{19}R^{20}$ ,  $-(C_1-C_6 alkylene)-COOR^{19}$ ,  $-CH=CH-COOR^{19}$ ,  $-CF_3$ ,  $-CN$ ,  $-NO_2$  and halo;

$R^{15}$  and  $R^{17}$  are each independently selected from the group consisting of  $-OR^{19}$ ,  $-OC(O)R^{19}$ ,  $-OC(O)OR^{21}$ ,  $-OC(O)NR^{19}R^{20}$ ;

- 65 -

$R^{16}$  and  $R^{18}$  are each independently selected from the group consisting of H, (C<sub>1</sub>-C<sub>6</sub>)alkyl and aryl;

or  $R^{15}$  and  $R^{16}$  together are =O, or  $R^{17}$  and  $R^{18}$  together are =O;

5

d is 1, 2 or 3;

h is 0, 1, 2, 3 or 4;

s is 0 or 1;

t is 0 or 1;

10

m, n and p are each independently selected from 0-4;

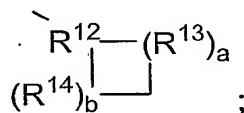
provided that at least one of s and t is 1, and the sum of m, n, p, s and t is 1-6; provided that when p is 0 and t is 1, the sum of m, n and p is 1-5; and provided that when p is 0 and s is 1, the sum of m, t and n is 1-5;

v is 0 or 1;

15

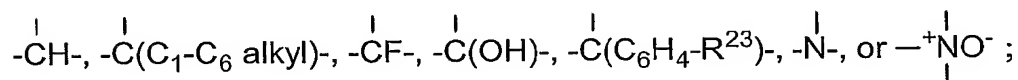
j and k are each independently 1-5, provided that the sum of j, k and v is 1-5;

Q is a bond,  $-(CH_2)_q-$ , wherein q is 1-6, or, with the 3-position ring carbon of the azetidinone, forms the spiro group



20

wherein  $R^{12}$  is



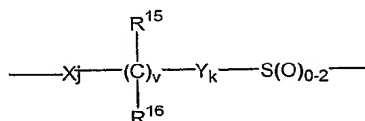
25

$R^{13}$  and  $R^{14}$  are each independently selected from the group consisting of  $-CH_2-$ ,  $-CH(C_1-C_6 \text{ alkyl})-$ ,  $-C(\text{di-}(C_1-C_6 \text{ alkyl}))$ ,  $-CH=CH-$  and  $-C(C_1-C_6 \text{ alkyl})=CH-$ ; or  $R^{12}$  together with an adjacent  $R^{13}$ , or  $R^{12}$  together with an adjacent  $R^{14}$ , form a  $-CH=CH-$  or a  $-CH=C(C_1-C_6 \text{ alkyl})-$  group;

- 66 -

a and b are each independently 0, 1, 2 or 3, provided both are not zero;  
 provided that when R<sup>13</sup> is -CH=CH- or -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-, a is 1; provided that  
 when R<sup>14</sup> is -CH=CH- or -C(C<sub>1</sub>-C<sub>6</sub> alkyl)=CH-, b is 1; provided that when a is 2 or 3,  
 the R<sup>13</sup>'s can be the same or different; and provided that when b is 2 or 3, the R<sup>14</sup>'s  
 5 can be the same or different;

and when Q is a bond and L is



10 then Ar<sup>1</sup> can also be pyridyl, isoxazolyl, furanyl, pyrrolyl, thienyl, imidazolyl, pyrazolyl,  
 thiazolyl, pyrazinyl, pyrimidinyl or pyridazinyl;

R<sup>19</sup> and R<sup>20</sup> are each independently selected from the group consisting of H,  
 15 (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl and aryl-substituted (C<sub>1</sub>-C<sub>6</sub>)alkyl;

R<sup>21</sup> is (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl or R<sup>24</sup>-substituted aryl;

R<sup>22</sup> is H, (C<sub>1</sub>-C<sub>6</sub>)alkyl, aryl (C<sub>1</sub>-C<sub>6</sub>)alkyl, -C(O)R<sup>19</sup> or -COOR<sup>19</sup>;

20 R<sup>23</sup> and R<sup>24</sup> are each independently selected from the group consisting of 1-3  
 substituents which are each independently selected from the group consisting of H,  
 (C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>6</sub>)alkoxy, -COOH, NO<sub>2</sub>, -NR<sup>19</sup>R<sup>20</sup>, -OH and halo; and

25 R<sup>25</sup> is H, -OH or (C<sub>1</sub>-C<sub>6</sub>)alkoxy.

3. The method according to claim 1, wherein the at least one sterol  
 absorption inhibitor is administered to a subject in an amount ranging from about 0.1  
 to about 1000 milligrams of sterol absorption inhibitor per day.

- 67 -

4. The method according to claim 1, further comprising the step of administering at least one antidemyelination agent to the subject.

5. The method according to claim 4, wherein the antidemyelination agent is selected from the group consisting of beta interferon, glatiramer acetate and corticosteroids.

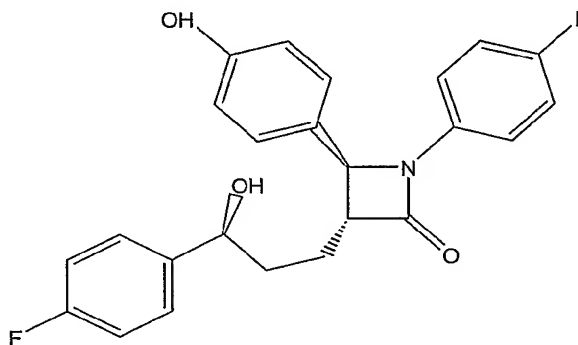
6. The method according to claim 1, further comprising the step of administering at least one HMG CoA reductase inhibitor to the subject.

7. The method according to claim 6, wherein the at least one HMG CoA reductase inhibitor is atorvastatin.

8. The method according to claim 6, wherein the at least one HMG CoA reductase inhibitor is simvastatin.

9. The method according to claim 1, wherein the subject has multiple sclerosis.

10. A method of treating or preventing demyelination in a subject is provided, comprising the step of administering to a subject in need of such treatment an effective amount of at least one sterol absorption inhibitor represented by Formula (II) below:



(II)

- 68 -

or a pharmaceutically acceptable salt or solvate thereof.

11. A method of treating or preventing multiple sclerosis in a subject, comprising the step of administering to a subject in need of such treatment an effective amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof.

12. A composition comprising: (a) at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof and (b) at least one antidemyelination agent.

13. A therapeutic combination comprising: (a) a first amount of at least one sterol absorption inhibitor or a pharmaceutically acceptable salt or solvate thereof; and (b) a second amount of at least one antidemyelination agent, wherein the first amount and the second amount together comprise a therapeutically effective amount for the treatment or prevention of demyelination in a subject.

14. Use of at least one compound of at least one of claims 1 or 2 for manufacture of a medicament for treatment of demyelination in a subject.

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 03/35027

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 A61K31/397 A61P25/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A61K A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, BIOSIS, EMBASE, SCISEARCH, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 03/082192 A (SMITHKLINE BEECHAM CORP ;MA CHUM (US); BHAT AJITA (US); FRAZEE JAM) 9 October 2003 (2003-10-09) page 23, line 10-30; claim 37 ---	1,11
X	WO 02/070523 A (DIDIUK MARY THERESA ;GARIGIPATI RAVI SHANKER (US); LAU WAN FANG (U) 12 September 2002 (2002-09-12) page 13, line 29 -page 14, line 18; claims 8,14 -----	1,12-14

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

7 April 2004

Date of mailing of the international search report

21/04/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Friederich, M

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.1

Although claims 1-13 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.

-----

Continuation of Box I.1

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy

-----

Continuation of Box I.2

Present claims 1-8, 10 and 12-14 relate to a method/composition defined by reference to desirable characteristics or properties, namely "sterol absorption inhibitor" and "demyelination".

The claims cover all methods/compositions having this characteristics or properties, whereas the application provides support within the meaning of Article 6 PCT and/or disclosure within the meaning of Article 5 PCT for only a very limited number of such methods/compositions. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible. Independent of the above reasoning, the claims also lack clarity (Article 6 PCT). An attempt is made to define the method/composition by reference to a result to be achieved. Again, this lack of clarity in the present case is such as to render a meaningful search over the whole of the claimed scope impossible. Consequently, the search has been carried out for those parts of the claims which appear to be clear, supported and disclosed, namely those parts relating to the compounds I-XII mentioned in claim 2 and the diseases mentioned in the description at page 1, lines 19-32.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 03/35027

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: —  
because they relate to subject matter not required to be searched by this Authority, namely:  
see FURTHER INFORMATION sheet PCT/ISA/210
2. ☒ Claims Nos.: —  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/35027

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 03082192	A	09-10-2003	WO 03082192 A2	09-10-2003
WO 02070523	A	12-09-2002	CA 2440803 A1	12-09-2002
			EP 1368354 A1	10-12-2003
			WO 02070523 A1	12-09-2002
			US 2003008893 A1	09-01-2003

# INTERNATIONAL SEARCH REPORT

4/0

PCT REQUEST

CV01679

Original (for SUBMISSION) - printed on 04.11.2003 02:57:22 PM

VIII-2-1	<b>Declaration: Entitlement to apply for and be granted a patent</b> Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name:	<b>in relation to this international application</b>  <b>SCHERING CORPORATION</b> <b>is entitled to apply for and be granted a patent by virtue of the following:</b>
VIII-2-1 (iv)		<b>an assignment from FINE, Jay, S. to SCHERING CORPORATION, dated 28 October 2003 (28.10.2003)</b>
VIII-2-1 (iv)		<b>an assignment from PARKER, Eric, McFee to SCHERING CORPORATION, dated 28 October 2003 (28.10.2003)</b>
VIII-2-1 (ix)	<b>This declaration is made for the purposes of:</b>	<b>all designations except the designation of the United States of America</b>

# INTERNATIONAL SEARCH REPORT

PCT REQUEST

3/0

CV01679

Original (for SUBMISSION) - printed on 04.11.2003 02:57:22 PM

VIII-2-2	<b>Declaration: Entitlement to apply for and be granted a patent</b> Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name:	<b>in relation to this international application</b>  <b>SCHERING CORPORATION</b> <b>is entitled to apply for and be granted a patent by virtue of the following:</b>
VIII-2-2 (iv)		<b>an assignment from ERBEY, John, R., II to SCHERING CORPORATION, dated 18 September 2003 (18.09.2003)</b>
VIII-2-2 (iv)		<b>an assignment from FINE, Jay, S. to SCHERING CORPORATION, dated 28 October 2003 (28.10.2003)</b>
VIII-2-2 (iv)		<b>an assignment from VELTRI, Enrico, P. to SCHERING CORPORATION, dated 28 October 2003 (28.10.2003)</b>
VIII-2-2 (ix)	<b>This declaration is made for the purposes of:</b>	<b>all designations except the designation of the United States of America</b>

# INTERNATIONAL SEARCH REPORT

PCT REQUEST

Original (for SUBMISSION) - printed on 04.11.2003 02:57:22 PM

CV01679

VIII-3-1	<b>Declaration: Entitlement to claim priority</b> Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii)): Name:	<b>in relation to this international application</b>  <b>SCHERING CORPORATION</b> <b>is entitled to claim priority of earlier application No. 60/424,165 by virtue of the following:</b>
VIII-3-1 (iv)		<b>an assignment from FINE, Jay, S. to SCHERING CORPORATION, dated 18 December 2002 (18.12.2002)</b>
VIII-3-1 (iv)		<b>an assignment from PARKER, Eric, McFee to SCHERING CORPORATION, dated 18 December 2002 (18.12.2002)</b>
VIII-3-1 (ix)	This declaration is made for the purposes of:	<b>all designations</b>

# INTERNATIONAL SEARCH REPORT

110

PCT REQUEST

CV01679

Original (for **SUBMISSION**) - printed on 04.11.2003 02:57:22 PM

VIII-3-2	<b>Declaration: Entitlement to claim priority</b> Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(III) and 51bis.1(a)(III)): Name:	<b>in relation to this international application</b>  <b>SCHERING CORPORATION</b> <b>is entitled to claim priority of earlier application No. 60/493,318 by virtue of the following:</b>
VIII-3-2 (iv)		<b>an assignment from ERBEY, John, R., II to SCHERING CORPORATION, dated 07 August 2003 (07.08.2003)</b>
VIII-3-2 (iv)		<b>an assignment from FINE, Jay, S. to SCHERING CORPORATION, dated 07 August 2003 (07.08.2003)</b>
VIII-3-2 (iv)		<b>an assignment from VELTRI, Enrico, P. to SCHERING CORPORATION, dated 07 August 2003 (07.08.2003)</b>
VIII-3-2 (ix)	This declaration is made for the purposes of:	<b>all designations</b>